



FEDERATION OF MALAYA

ANNUAL REPORT

of the

DEPARTMENT OF AGRICULTURE

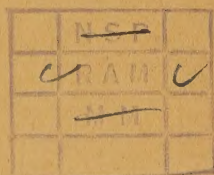
for the year

1958

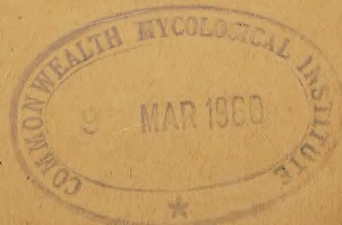
By

P. G. COLEMAN

*Acting Director of Agriculture
Federation of Malaya*



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Durian fruit of a selected variety grown at the Federal Experiment Station, Serdang. The tree is ten years old.



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P. G. COLEMAN

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KUALA LUMPUR

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AGRICULTURE, 1957

Erratum

1957 Annual Report of the Department of Agriculture Page
78, para. 470, line 22 *Yield of Fresh Marketable Vegetables:*
"lb. per acre" should read "lb. per 1/25 acre".

ANNUAL REPORT OF DEPARTMENT OF
AGRICULTURE, 1958

Errata

Page 63, para. 369, 2nd line: "but" should read "out".

Page 68, para. 396. Add new opening sentence as follows:

"Oil palm at the Federal Experiment Station, Jerangau,
Trengganu, continued to grow and yield well. It is
now"

Page 71, para. 415, 1st line: "33" should read "33".

Illustrations.

Government Printer regrets
that these were bound in
the wrong order.

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, FEDERATION OF MALAYA, FOR THE YEAR 1958

SECTION I

POLICY AND PROGRESS

A.—POLICY

The agricultural policy of the present Government is eventually to attain self sufficiency in essential foodstuffs. Other aspects of its policy which are directly the concern of the Department of Agriculture are :

- (a) To increase, both quantitatively and qualitatively, existing agricultural produce and to diversify cropping;
- (b) To provide agricultural education on as extensive a scale as possible.

The Department is also concerned, but to a lesser degree, with the following broad aspects of agricultural policy :

- (c) To ensure security to cultivators;
- (d) To improve marketing systems;
- (e) To give financial assistance to agriculturists.

B.—ORGANISATION OF THE DEPARTMENT

2. The Constitution of the Federation of Malaya prescribes broadly that Research shall be a Federal responsibility and that Extension shall be in the hands of the respective State Governments. Although, in effect, this means that there is one Federal Department of Agriculture and eleven separate State Departments of Agriculture, Clause 94 (1) of the Constitution provides that Departmental staff in the States shall accept any professional advice given to the Government of any State by the Federal Department. In practise, the arrangement works reasonably well but it calls for very close co-operation between Departmental officers in the States and the Federal head of the Field Branch, who is the co-ordinating officer on extension activities.

C.—FINANCE

3. The financial crisis which came to light early in the year resulted in the withholding of all funds provided in the budget of the second Development Plan, with the exception of those items which had already been inescapably or contractually committed. In so far as the Department was concerned, very little had been so committed so early in the year, with the result that implementation of the 1958 portion of the Development Plan had to be postponed.

4. The provision of annually recurrent funds in both the Federal and State sections of the Department were unaffected by the conditions of financial stringency and proved, for the most

part, adequate for the maintenance of essential agricultural services. During the year, however, Government found it necessary to impose a restriction on recruitment, even to vacant established posts, and to prohibit the creation of new posts.

5. This unfortunate financial situation provided the atmosphere in which the 1959 Estimates Proposals were framed and it is inevitable that this will have an adverse effect on the work of the Department in the coming year.

D.—STAFF

6. Since the start of the implementation of the Malayanisation scheme, the Department had lost 21 expatriate officers by the end of 1958. This represents a reduction of the expatriate establishment by 45.6 per cent since 1st July, 1957, and left a total of 23 vacancies in Division I to be filled as at 31st December, 1958, or 31.5 per cent of the total Division I strength.

7. Retirements due to Malayanisation during 1958 amounted to eight officers, and one other officer retired on age limit. In spite of the loss of a large proportion of experienced officers during the past two years, the work of the Department has been maintained at a high level of efficiency, thanks to the very considerable efforts of the remaining officers, of all nationalities, who have been called upon to shoulder greatly increased responsibilities and a greater volume of work.

8. The maintenance of agricultural services was assisted by the new appointment of seven Malayan officers during the year, one by transfer from another Department and six on return from higher studies overseas. Four of the new appointees entered various divisions of the Research branch, two went to Field branch and one to the Agronomy branch.

9. Total vacancies in all sections of the Agricultural Assistant cadre amounted to 28 at the end of the year, of which 21 were in the Field Branch. However, 14 Government Cadets are expected to graduate from the College of Agriculture next year and similar numbers in succeeding years so the backlog of vacancies, largely created as a result of the Japanese occupation period can be expected to be overtaken within three years.

10. In pursuance of the Departmental policy to bring about a substantial increase in the establishment of Junior Agricultural Assistants, particularly in the extension services of the States, a total of 61 new Junior Agricultural Assistants were recruited during the year, of whom 48 were for the Field Branch. Owing to the very large numbers of applicants for these posts, it is possible to set a high standard and to select good men of the right type.

E.—PROGRESS IN 1958

11. In spite of staff shortages good progress was made during the year in practically all aspects of the Department's activities, a brief summary of which follows:

12. *Rubber.*—The Director continued to officiate as the Executive officer of the Rubber Industry (Smallholders) Planting Material Scheme, whereby the Department is responsible for the

supply of all approved rubber planting material to smallholders, both for replanting and new planting and for the supply of planting material of approved other crops for replanting. All requirements of planting materials by smallholders were met during the year.

13. More large land development schemes, all based on rubber as the main cash crop, were initiated during 1958 and the Block New Planting Scheme for smallholders was also introduced early in the year.

14. *Padi*.—The total crop obtained from the 1957/58 season set yet another new record and, for the first time, the figure of 500,000 tons of rice was exceeded. This result was achieved more as a result of a high national average yield per acre than of an increase in acreage.

15. The selection and breeding programme was maintained and proceeded in accordance with the long-term plan to produce improved varieties for each ecological zone and, eventually, for specified localities within those zones. The programme of agronomic investigations was of necessity curtailed by severe staff shortages within the Branch but solid progress was made within a restricted field. Important advances were made in the direction of stem-borer and *penyakit merah* investigations and next year should see the stage being reached when practical recommendations can be made for their amelioration or control.

16. Extension work on padi was stepped up with particular emphasis on the use of fertilisers, both in the nursery and in the field; the adoption of improved varieties; the improvement of cultivation techniques and the use of pest control measures. The Progressive Farmer technique of result demonstration was extended and proved to be one of the most successful methods of persuading farmers to adopt improved techniques.

17. *Coconuts*.—Additional simple manurial demonstration plots were laid down on the *beris* soils of the East Coast and these attracted considerable interest among the smallholders, most of whom are part-time fishermen and are in a position to obtain quantities of fish and other refuse from the sea, for use as organic manure.

18. Further satisfactory development continued on the two new Coconut Stations, namely the selection and breeding station at Telok Bharu, Perak, and the rehabilitation station in South-West Johore.

19. *Fruit*.—Agronomic investigations on this crop were similarly affected by staff shortages, but interesting results were obtained from an existing Durian varietal trial which came into fruiting for the first time and also from observation plantings of Rambutan on deep peat.

20. A further substantial increase in the output of budded fruit trees was recorded during the year and there is evidence that extension work on the rehabilitation of neglected orchards, particularly in the direction of pruning and manuring, is beginning to be appreciated and increasingly adopted.

21. *Pineapple*.—The process of handing over responsibility for agronomic and processing research on this crop to the Malayan Pineapple Industry Board, was continued and is expected to be completed next year.

22. The industry was badly hit by the increasing world competition in the canned Pineapple market, which threatened to price Malaya, with its high processing costs, out of the market. The small growers were the section most severely affected and this focussed attention on the urgent necessity, long mooted by this Department, of creating a small growers co-operative factory which would render them independent of uneconomic fruit prices offered by large canners.

23. *Foodcrops and Vegetables*.—Notably on the East Coast, the growing of foodcrops and vegetables on padi land during the off-season is an important industry. A welcome trend, which became increasingly noticeable during the year, is the abandonment of past haphazard methods and the adoption of advice from the extension services leading to the use of better planting material, balanced fertilisers and in particular, modern insecticides.

24. *Oil Palms*.—The Department continued to contribute to the co-operative scheme of selection and breeding in which all major Oil Palm companies are participants. The Departmental plantings at the Federal Experiment Station, Jerangau, Trengganu, continue to make very promising growth and early yields are most encouraging.

25. *Tea*.—Agronomic investigations at Cameron Highlands have demonstrated that considerable and highly economic increments of yield can be obtained by increasing applications of nitrogen. Lowland tea is attracting further interest from estates but there is so far no sign of similar interest being displayed by smallholders.

26. *Cocoa*.—The incidence of the disorder known as “die back” became widespread and reached somewhat alarming proportions during the year. Shortage of staff, however, precluded an all-out effort to tackle the problem, although sufficient work was possible to eliminate, with some degree of certainty, the suggestion that a pathogen was responsible. It is now considered that the disorder is the result of a complex nutritional imbalance.

27. *Livestock and Fodders*.—The success of the Department's efforts to introduce Middle White blood into the pig rearing industry has been such that it is now extremely difficult to obtain Chinese sows without any admixture of Middle White blood. The danger of too great a dilution by introduced blood has, however, been realised in time and efforts are now being directed towards building up a nucleus herd of pure Chinese pigs which will be maintained pure.

28. The use of stylo (*Stylosanthes gracilis*) as a fodder for livestock has become extremely popular in the North-East and many cattle owners have established their own plots, thereby making them independent of other sources of fodder. The use of padi straw for bedding, in conjunction with stall-feeding, is also finding increasing favour and leading to the production of large quantities of high value farmyard manure.

29. *Soil Surveys*.—There were numerous demands for the services of the Soils Division to carry out *ad hoc* surveys of potential land development schemes and this inevitably disrupted the long-term programme of soil mapping. It was therefore decided to train certain members of the staff in each State in soil survey methods and to hand over responsibility for carrying out surveys to the State Departments in the case of small schemes. The Federal Department has retained responsibility for soil surveying the larger Federal Land Development Authority schemes.

30. A draft schematic soils map of Trengganu was completed during the year and good progress was made towards completing a reconnaissance soils map for Kedah; progress on compiling a similar map for Kelantan was hindered by demands for *ad hoc* surveys elsewhere.

31. *Economic Surveys*.—Part I of the Bulletin “The Economics of Padi Production in North Malaya”, dealing with land tenure, rents, land use and fragmentation was published in the middle of the year and was followed later in the year by “The West Johore Coconut Production Survey”.

32. *Agricultural Education*.—The College of Agriculture, which provides a three-year course leading to the award of a Diploma in Agriculture, continued as in the past, although it became increasingly evident that the number of students which can be accommodated is inadequate to meet the demands of Government Departments, quasi-Government organisations and commercial interests. Active consideration was given to ways in which the numbers can be increased and it is hoped that a solution may be found in the near future.

33. The Schools of Agriculture in operation remained at two during the year, but the third School was nearing completion at Kota Bharu, Kelantan, at the end of the year. These Schools are designed primarily to train Junior Agricultural Assistants for the Department in a series of courses aggregating 17 months in duration. The first of the female Junior Agricultural Assistants graduated from the School at Telok Chengai during the year.

34. Rural Agricultural Training Centres are now established in every State with the purpose of giving basic agricultural education to local farmers. The demand for such training has exceeded all expectations and has now far outstripped the capacity to supply; some States are now making provision for the establishment of additional centres, but the limiting factor is less one of finance than of finding suitable staff for teaching.

F.—GENERAL

35. I should like to congratulate all officers of the Department on the manner in which they have risen to the occasion and through whose efforts I am able to report that progress has been satisfactory and that efficiency has been maintained, in spite of the serious staff shortages and the lack of experienced officers. I have every confidence that so long as the present feeling of determination to maintain efficiency persists, the Department need have nothing to fear in the future.

SECTION II

AGRICULTURE

A.—WEATHER

36. The pattern of rainfall throughout the year was abnormal, and in all States, except Negri Sembilan, was below average. The distribution of rainfall was even more abnormal, and December, which is usually one of the wettest months everywhere, except in the north-west, was extremely dry. Droughts of some severity were experienced in most States, and the progress of padi planting was delayed.

37. The unusually dry weather in the north-east early in the year provided ideal conditions for the harvest of the main padi crop, but drought in the middle of the year delayed preparation of land for the following crop.

B.—CROP REPORTS

(i) RUBBER

38. Comparative acreages under rubber in the Federation are as follows:

Calendar Year		Estates (acres)		Smallholdings (acres)*		Total (acres)*
1952	...	1,997,000	...	1,500,000	...	3,500,000
1953	...	2,030,000	...	1,500,000	...	3,500,000
1954	...	2,018,000	...	1,500,000	...	3,500,000
1955	...	2,015,000	...	1,500,000	...	3,500,000
1956	...	2,008,000	...	1,500,000	...	3,500,000
1957	...	2,011,000	...	1,500,000	...	3,500,000
1958	...	1,981,000	...	1,500,000	...	3,500,000

39. Production figures for the Federation are given in the following table:

Calendar Year		Estates (Tons)		Smallholdings (Tons)		Total (Tons)
1952	...	341,100	...	241,500	...	582,600
1953	...	341,100	...	231,700	...	572,800
1954	...	344,900	...	240,200	...	585,100
1955	...	351,800	...	285,300	...	637,100
1956	...	350,800	...	273,400	...	624,200
1957	...	369,070	...	268,020	...	637,100
1958	...	390,100	...	271,500	...	661,600

* Estimates only, no accurate figures being available.

40. The Pan-Malayan imports and exports of rubber were :

Calendar Year		Gross Exports (Tons)		Gross Imports (Tons)		Net Exports (Tons)
1952	...	910,400	...	338,900	...	571,500
1953	...	847,200	...	277,500	...	569,700
1954	...	915,100	...	344,200	...	570,900
1955	...	994,200	...	362,300	...	631,900
1956	...	983,300	...	365,800	...	617,500
1957	...	1,002,200	...	363,300	...	638,900
1958	...	1,079,900	...	413,300	...	666,600

41. The price of International Type I (R.S.S.1) rubber remained fairly stable throughout the year, and averaged 77.65, 74.85, 81.19 and 87.03 cents per lb. for the four quarters respectively. The overall average for the year was 79.57 cents, as compared with an average price of 88.75 cents in 1957, 96.76 cents in 1956 and 114.16 cents in 1955.

42. The volume of production from smallholders showed a further fall in 1958, reflecting the slightly lower price for rubber, and an increase in replanting. The actual fall in production was 20,387 tons, as compared with a drop of 5,376 in 1957, and 11,900 tons in 1956.

43. Rubber in Malaya is marketed in the form of Ribbed Smoked Sheet (RSS), Crepe and Preserved Latex, with small quantities of specialised types such as Rubber Powder and Cyclised Rubber. Approximately 58.4 per cent of the rubber in the Federation was exported in the form of ribbed smoked sheet, 30.3 per cent as crepes of various types, and 11.3 per cent as preserved latex.

44. Latex marketing schemes, introduced in an effort to raise the quality of smallholder rubber, and thus increase the value of his crop, have made little further progress, and in fact some processing centres have had to close down for lack of support.

45. The following schemes to assist the rubber industry are now in operation :

- (1) Rubber Replanting Scheme A for estates; this offers assistance at the rate of \$400 per acre.
- (2) Rubber Replanting Scheme B for smallholders, which offers assistance at the rate of \$600 per acre.
- (3) Rubber Industry (Replanting) Scheme, which allows smallholders with five acres of rubber or less and who also own other land not yet planted, to new plant up to the equivalent acreage of his present rubber holding. When the new trees come into bearing the trees in the old holding must be cut out and replanted. A grant of \$600 per acre is given in assistance.

- (4) Rubber Industry (Smallholder) New Planting Scheme.
This is a new scheme which was finalised at the end of 1957. It provides assistance at the rate of \$400 per acre to selected block new planting schemes in which individual participants plant not less than six and not more than seven acres of rubber.

46. Schemes (2) and (3) are the concern of the Administrators of Fund "B" of the Rubber Replanting Scheme, under whose direction the Smallholders' Replanting Organisation functions. The aim of Scheme (2) is to replant a total of 500,000 acres of smallholding rubber in seven years from the date of the Scheme's inception. Of necessity, having regard to the need for staff recruitment and training, as well as for publicity in the early stages, the annual target for replanting was graded, commencing with 40,000 acres in the first year and ending with 90,000 acres in the final year. The whole undertaking is a most formidable one and there are few, if any, schemes elsewhere in tropical agriculture of equal magnitude and importance.

47. The replanting target for 1958 was 90,000 acres, and was again not reached, although progress was more encouraging than for some years past. Of 20,588 applicants who wished to replant rubber on 95,055 acres, some 15,762 owning 71,699 acres fulfilled the stipulated conditions, and received approval. By the end of December, 11,947 applicants owning 61,650 acres of land had completed felling, clearing, lining and holing and had received the first payment of the grant. The comparable figures for 1957 are 10,228 applicants, owning 37,780 acres of land.

48. Whenever conditions are suitable, and the applicant desires, encouragement is given to the replanting of crops other than rubber. This policy resulted in 1,557 smallholders applying to plant with other crops. By the end of the year, 1,130 applicants, owning 3,178 acres, had been accepted, as compared with 1,602 applicants on 4,412 acres in 1957.

49. From the date of commencement of the scheme up to the end of 1958, 220,052 acres of smallholding rubber had been replanted with high yielding rubber and 16,865 acres with approved alternative crops. The latter comprised fruit 4,506 acres, coconut 4,395 acres, coffee 2,328 acres, padi 1,986 acres, pineapples 2,907 acres and sago 743 acres. In addition, 7,233 acres of rubber and 373 acres of other crops had been replanted as excess acreage, giving a total replanted acreage under the scheme of 244,500 acres. At the end of 1958 the total financial outlay amounted to approximately \$83,909,000.

50. A high standard of maintenance is required in replanted holdings, for without such maintenance the crops cannot be expected to produce as profitably as they might. The main difficulty in replantings has been found to be lalang (*Imperata cylindrica*) and complete eradication of this weed is insisted upon. If maintenance in any respect is found to be below standard, part, or all, of the cash grant can be withheld.

51. The illegal planting of rubber by smallholders, reported in previous years, has continued. This is particularly unfortunate, for the majority of such holdings are planted with unselected

planting material, and the yields will therefore be well below that of holdings planted with proved material. The country will thus lose in potential crop, and the smallholders concerned will not be so well placed to meet possible falls in price.

52. In most States the strong demand for land for the new planting of rubber has continued. This has been given emphasis by the scheme for block new planting of rubber, under which financial assistance is given to smallholders, provided specific conditions of management are adhered to. Under the block new planting scheme, assistance to the extent of \$400 per acre is granted for lots of not less than six and not more than seven acres, in blocks of not less than 250 acres, and where improved planting material has been used. Block planting of rubber is also being encouraged by the Federal Land Development Authority, which has now authorised several schemes in various States, the largest of which is the Bilut Valley scheme in Pahang.

53. With an increase in the acreage of estates approved for the collection of rubber clonal seed, and a good seedfall year, sufficient seed to meet anticipated demand for clonal seedling stumps was collected in the main seedfall season, without the necessity for imposing a ban on the export of seed. A total of 35,545,820 seed were planted in nurseries under departmental control. At the end of the year, regulations imposing an export duty on rubber planting material were imposed, to come into force on the 1st January, 1959.

(ii) RICE

54. The 1957/58 season produced a record crop, surpassing even the record crop of the previous season. The total yield of wet padi was 761,500 tons, compared with 746,000 tons for the previous season. The high yield reflects favourable weather conditions, a larger acreage planted and improving techniques.

55. The following figures show the improvement in yield per acre over the past 30 years:

Season	Average yield in gantangs per acre	
1926/27	...	207
1931/32	...	291
1936/37	...	297
1940/41	...	275
1946/47	...	222
1951/52	...	277
1953/54	...	324
1957/58	...	358

56. Estimates of the acreage of wet padi planted in the 1958/59 season show an increase of approximately 10,000 acres, reflecting the growing interest in padi cultivation. Weather conditions for the 1958/59 season were not so favourable as for the past few seasons, and there were droughts of varying

intensities which affected the planting and land preparation programmes, and the probability is that the yield for the 1958/59 season will not come up to the record 1957/58 yield.

57. The following table gives comparative figures for acreages under wet and dry padi, together with yields, since 1950 :

Season	Wet Padi			Dry Padi			Total Padi	
	Acreage (Planted)	Yield (Tons)		Acreage (Planted)	Yield (Tons)		Acreage (Planted)	Yield (Tons)
1950-51	... 829,000	685,000	...	47,000	18,000	...	876,000	703,000
1951-52	... 790,000	526,000	...	41,000	16,000	...	831,000	542,000
1952-53	... 790,000	684,000	...	44,000	16,000	...	834,000	700,000
1953-54	... 809,000	635,000	...	37,000	13,000	...	846,000	648,000
1954-55	... 843,000	633,000	...	48,000	19,000	...	891,000	652,000
1955-56	... 825,000	644,100	...	51,000	23,000	...	876,000	667,000
1956-57	... 841,000	746,000	...	55,000	28,000	...	896,000	774,000
1957-58	... 850,000	762,000	...	50,000	25,000	...	900,000	787,000
1958-59	... 860,000	667,000	...	56,000	28,000	...	916,000	695,000

58. Dry padi in this country is grown under two entirely different sets of conditions, either in semi-wet soil, as in Kelantan and Trengganu (Padi Tugalan, Padi Taboran or Padi Tenggalan) now known as lowland dry padi; or in dry soil as hill padi, now classified as upland dry padi.

59. In the 1958/59 season, 33,800 acres were planted with lowland dry padi, and 22,650 with upland dry padi. The corresponding figures for the 1957/58 season were 33,250 acres and 16,750 acres. The main increase in the area of upland dry padi occurred in the States of Kedah, Kelantan and Pahang, and is associated with an increase in the area being prepared for the new planting of rubber.

60. The acreage double cropped with padi in 1958 was almost exactly the same as in 1957, viz. 7,290 acres. The average yield at 400 gantangs per acre was the highest on record, the figure for the 1957 off season being 373 gantangs per acre.

61. Double cropping is at present restricted to the Sg. Kulim Irrigation Area of Province Wellesley and the Yen area of Kedah, and in both areas it is now a well established practice. There are possibilities of double cropping in some areas of Perak, but shortage of water and severe bird damage discouraged planters who had attempted double cropping on 180 acres in Krian South in 1957. Planters in Kelantan have expressed an interest in double cropping, and it is hoped that about 500 acres may be so cropped in 1959.

62. In both the 1956 and 1957 annual reports, attention was drawn to the fact that the average yield of padi in Malaya is the highest in South-East Asia. Some of the credit for this state of affairs can justly be claimed by the Department of Agriculture, through its efforts in selecting and distributing higher yielding varieties, work on manurial requirements of the crop, and the encouragement of better cultural practices generally. There is no doubt, however, that considerably higher yields are possible. In the Tanjong Karang area of Selangor yields of over 1,300 gantangs

per acre have been reaped from a single crop, while in the Jelebu area of Negri Sembilan a farmer obtained a yield of 1,200 gantangs per acre, using a selected Serendah Kuning variety. In the double cropped areas of Province Wellesley, yields of up to 1,200 gantangs per acre, from the main and off season crop combined, have been obtained.

63. The average price of imported Siam rice (new crop) in 1958 was \$30.37 per picul, an increase of 31 cents over the average 1957 price. In spite of better international supplies of rice, the policy of the Government has as its objective the highest possible production of rice in Malaya, and a reduced dependency on imported supplies.

64. The data obtained from economic surveys carried out in North Malaya during 1954 to 1956 was analysed and the sections on land tenure, rents, land use and fragmentation were published as a Departmental bulletin. Legislation to amend the Padi Cultivators (Control of Rent and Security of Tenure) Ordinance, 1955, has not yet been introduced.

65. The Padi Planters Board, Kedah, continued its operations during 1958, and expended a little over \$1,000,000. Of this sum, about \$34,000 were expended on redeeming 197.5 acres of padi land from *jual janji* (mortgage), \$44,249 on redeeming 262 acres from *gadaian* (usufructuary loan), \$407,900 on the purchase and resale of padi land to farmers, and \$543,200 on the purchase and resale of rubber land to members of the Padi Planters Association.

66. By the end of the year, registered members of the Padi Planters Association had increased to 46,347.

67. Subsidies were in operation in four States for the purchase of artificial manures for padi. In Kelantan the scheme was in its seventh year of operation, and although the subsidy was at its lowest level, only 90 cents per 100 lb. bag, the price to the farmer being \$10.50 per 100 lb. bag, more fertiliser was sold than in any previous year. The total quantity sold was 3,830,750 lb., compared with 3,133,300 lb. in 1957. At the recommended rate of 200 lb. per acre, sufficient fertiliser was sold for 19,154 acres, or 9.8 per cent of the planted acreage in Kelantan. There is little doubt that fertiliser is applied at less than the recommended rate, and a considerably higher acreage receives some manure.

68. In Trengganu, the State-wide subsidy scheme was in operation for the second year running. The rate of subsidy was reduced from an average of \$7 per 100 lb. bag to \$2 per bag, but in spite of this, more fertilizer was sold, the total quantity being 1,057,280 lb. as compared with 832,100 lb. in 1957. The quantity sold in 1958 represents sufficient manure to fertilise 5,286 acres, or 11.1 per cent of the planted acreage at the recommended rate of application.

69. In Negri Sembilan the total quantity of manure sold was 588,128 lb. compared with 490,000 lb. in 1957. The mixture recommended in Negri Sembilan is slightly more expensive than in Kelantan and Trengganu, and the recommended rate of application slightly higher, with the result that the unsubsidized cost is higher. At recommended rates the cost per acre is \$30, of which the

cultivator paid \$18.50, and the subsidy was \$11.50 in 1958. Sufficient manure was sold for approximately 2,162 acres, about 7.3 per cent of the planted acreage in the State at the recommended rate.

70. In Malacca, the fertiliser subsidy remained the same as in 1957, that is, \$3.40 per 100 lb. bag. The actual cost of the fertilizer was \$13.40 per 100 lb. bag, so that the cost to cultivators was \$10.00 per bag. A total of 207,000 lb. of fertilizer was sold, sufficient to manure 1,035 acres at the recommended rate of 200 lb. per acre. This compares with sales of 198,000 lb. sold in 1957, sufficient for 990 acres.

71. All the four schemes mentioned are being financed from the grant of \$10 million made by the Federal Government for assistance to padi planters.

72. In Johore, although no allocation of funds was received from Federal Government under the above mentioned scheme, fertilizers for use on wet padi are subsidized by the State Government.

73. In other States in the Federation, no subsidy schemes are in operation, although increasing quantities of manures are being used on padi. These are mainly rock phosphate, bat guano and bone manure. The use of fertilizers for padi is steadily growing, and more and more cultivators have come to appreciate the benefits that accrue from manuring. But there is a need for a Federation wide subsidy scheme, especially since the existing subsidy schemes will soon cease, owing to the exhaustion of funds. A general subsidy on artificial manures is in operation in many countries of the world, and it is considered that there are strong grounds for the introduction of a similar type of subsidy in the Federation.

74. As a result of research and investigations, numerous selected varieties of padi are now available, and interim recommendations with regard to manuring have been made for several areas. In Negri Sembilan selected strains of the variety Serendah Kuning are now being used on a commercial scale, while the Department arranges for bulk distribution of seed, and in Malacca another selected variety, Nachin 39, is in commercial use.

75. Data in regard to annual Pan-Malayan retained imports of rice, and their costs, are given in the following table:

NET IMPORTS OF RICE

(Pan-Malayan)

Year		Tons		Value in \$
1951	...	499,000	...	218,740,000
1952	...	423,000	...	198,886,000
1953	...	494,000	...	271,079,000
1954	...	268,000	...	124,812,000
1955	...	484,000	...	164,031,000
1956	...	503,000	...	179,307,000
1957	...	404,000	...	151,583,000
1958	...	462,000	...	178,065,000

(iii) OIL PALM

76. Oil Palm cultivation in Malaya is at present restricted to large estates, but with organised harvesting and processing, there is no reason why it should not become a profitable smallholder crop. The Federal Land Development Authority began consideration in 1958 of a development scheme in Johore, of which the main crop will be smallholding oil palm, and in Trengganu the State Government took steps to reserve a large block of land for oil palm cultivation.

77. Details of acreage planted, and production of oil and kernels are as follows:

Year		Planted Acreage		Palm Oil (Tons)		Palm Kernels (Tons)
1951	...	97,000	...	43,000	...	12,000
1952	...	100,000	...	45,000	...	11,000
1953	...	108,000	...	49,000	...	13,000
1954	...	109,000	...	54,000	...	14,000
1955	...	111,000	...	56,000	...	15,000
1956	...	115,000	...	56,000	...	14,000
1957	...	116,000	...	58,500	...	15,000
1958	...	122,000	...	69,700	...	18,000

(iv) COCONUT

78. The main coconut areas of the Federation are the West coastal area of Johore, the Selangor coastal area, the Bagan Datoh area of Perak, the coastal area of Province Wellesley and the East coastal area north from Kuantan, in Pahang, through Trengganu and Kelantan.

79. Coconuts are planted both as a mixed and pure stand, the former largely by smallholders, and the latter by estates. Coconuts come next in importance to rubber and rice as smallholder crops, although the acreage remains fairly constant from year to year. On good soils, such as the coastal alluvium, with adequate drainage, yields of up to 1,600 lb. of copra per acre per annum are obtained, but the majority of the smallholders acreage return yields much lower than this.

80. The following table shows production of coconut oil and copra in the Federation:

PRODUCTION (TONS)

FEDERATION OF MALAYA

Year		Estates		Smallholdings		Coconut Oil		Copra Cake
1953	...	40,000	...	112,000	...	79,000	...	50,000
1954	...	40,000	...	124,000	...	97,000	...	62,000
1955	...	40,000	...	104,000	...	95,000	...	60,000
1956	...	39,000	...	115,000	...	108,000	...	68,000
1957	...	36,000	...	94,000	...	97,000	...	61,000
1958	...	35,000	...	73,000	...	79,000	...	51,000

81. The shortage of supplies of copra which local oil millers have experienced since the end of the war continued in 1958, with the result that gross imports of copra continue to exceed gross exports, as the following table indicates:

NET IMPORTS OF COPRA				
Year		Tons		Value \$
1951	...	11,000	...	6,606,000
1952	...	28,000	...	4,501,000
1953	...	10,000	...	2,085,000
1954	...	67,000	...	23,446,000
1955	...	75,000	...	24,446,000
1956	...	83,000	...	29,051,000
1957	...	72,000	...	25,517,000
1958	...	56,000	...	18,994,000

82. Net exports of coconut oil fell as is indicated by the following table:

NET EXPORTS OF COCONUT OIL				
Year		Tons		Value \$
1951	...	68,000	...	87,508,000
1952	...	65,000	...	53,966,000
1953	...	61,000	...	58,033,000
1954	...	79,000	...	74,719,000
1955	...	91,000	...	67,554,000
1956	...	103,000	...	73,318,000
1957	...	100,000	...	75,473,000
1958	...	67,000	...	56,039,000

83. Although there is a fairly considerable market in fresh nuts, largely met by smallholder production, the main market is for copra and oil. Estate produced copra is of high quality, but that produced by smallholders is of poor or indifferent quality. The Department has consistently tried to remedy this situation with advice to smallgrowers, but it is unfortunate that good quality copra receives little or no premium over poor quality, and smallgrowers have insufficient incentive to improve their grades.

84. During 1956 and 1957 an economic sample survey of the West Johore coconut areas was conducted, and the results were published in 1958. The survey indicates the extent to which coconut production in Johore, which is almost entirely in the hands of smallholders, has declined, and makes recommendations for its rehabilitation.

85. Drainage work in the coastal coconut areas of Johore continued during the year, and there was some further improvement in the situation, although much remains to be done. Generally, over the Federation, yields are declining, and an organised replanting scheme appears to be necessary.

86. The Rhinoceros Beetle (*Oryctes rhinoceros*), continues to cause severe damage to coconuts, especially to young palms, and it is evident that the pest is increasing. Any replanting programme will have to take into account the damage caused by the beetle, and the difficulty of controlling it.

87. A disease, reported in the 1957 report as occurring in Johore, has not yet been identified, although it is not spreading to any extent. It is possibly due to physical conditions in the soil.

(v) PINEAPPLE

88. Pineapples are grown throughout the Federation, but only in three States for canning. Pineapples for canning are grown almost entirely on deep peat, and it is fortunate that the crop grows well in such areas, which are of little use for other forms of agriculture.

89. The area under pineapples decreased over the year. This was entirely as a result of a decrease in the acreage of pines for canning; the acreage of pines for fresh fruit consumption showed a slight increase. The total acreage under cultivation over the past five years is shown below:

1954	1955	1956	1957	1958
27,950	34,850	44,780	45,550	44,360

90. Of these totals, the acreage devoted to pineapples for canning are:

	1954	1955	1956	1957	1958
Estates ...	8,976	13,876	19,062	19,616	19,322
Smallholders ...	12,106	16,499	18,974	17,000*	13,600

91. During the year the pineapple canning industry passed through a difficult period, which culminated, towards the end of the year, in a refusal on the part of certain canneries to accept any further smallgrower fruit. The single cannery in Selangor closed down in August, 1958, and did not re-open during the remainder of the year. As a result, smallgrowers in Selangor had no market for their fruit. In Johore, considerable hardship was caused to smallgrowers through the refusal of canneries to accept fruit, especially as this occurred during the peak of the harvesting period.

92. A total of 317 million lb. of fruit was received by the canneries during the year as compared with 287 million lb. in 1957. Out of this figure, smallholders produced 86 million lb. and estates 231 million lb.

93. Exports of canned pineapples from the Federation amounted to 28,810 tons in 1958 as compared with 25,960 tons in 1957 and 22,275 tons in 1956.

94. Towards the end of the year, a proposal was put forward by the Malayan Pineapple Industry Board, the statutory body which is now responsible for the control of the industry, that a cannery to process smallgrower fruit should be established by Government. The Board felt that without such a cannery, the difficulties which smallgrowers have experienced in the past two years would prove impossible to correct.

* Estimate only.

(vi) CACAO

95. The bright prospects for cacao reported in 1956 and 1957 have been somewhat dimmed by the appearance of die back, and by falling yields in the block of mature cacao. The cause of cacao die-back has not yet been ascertained, but it is thought to be a deficiency disease of some kind.

96. As a result of the discouraging results with cacao, the second pilot scheme, which was to have been started in Pahang, has been deferred for the time being. It is hoped that when the situation has been clarified, and the cause of die-back ascertained, the pilot scheme in Pahang will be able to be started. The scheme in Trengganu is reported to be making steady progress, and symptoms of die-back were less pronounced in 1958 than in previous years.

97. The total acreage under cacao increased by 204 acres during the year. The increase was due to the planting of a further 212 acres by an estate in Trengganu, and the acreage at the end of the year was 1,525.

(vii) TEA

98. Interest in tea cultivation revived during the year, due to the good prices being obtained for the crop. While both low-land and highland tea is produced in Malaya, and although high-land tea is of better quality, the greater yield obtained from low-land tea more than offsets the slightly lower price.

99. Tea prices remained good throughout 1958, and the crop remains one of the most profitable in the Federation. Malayan tea of all grades was sold at about \$1.70 per lb. on the London market, while the local price of highland tea was about \$2.70 per lb. retail.

100. Production figures of made tea are as follows:

Year		Production (lb.)		Exports of Local Tea* (lb.)
1953	...	4,187,000	...	2,172,000
1954	...	4,590,000	...	2,757,000
1955	...	5,306,000	...	2,864,000
1956	...	5,023,000	...	3,633,000
1957	...	5,247,000	...	3,934,000
1958	...	4,878,000	...	4,333,000

(viii) FOOD CROPS, VEGETABLES AND FRUIT

101. The acreage under food crops increased from 106,531 acres at the end of 1957 to 121,000 acres at the end of 1958. The greater part of this acreage was occupied by the rice substitute crops, sweet potatoes, tapioca and yams, and by intensively farmed vegetable producing areas. Extensive acreages of food crops are grown for animal feeding, particularly pigs.

* In addition to these quantities, a small amount of Malayan tea is mixed with foreign teas and then exported.

102. An expansion of the area under maize and groundnuts occurred, especially off season cropping of padi land. Maize is grown in the Federation almost entirely as a vegetable, the crop being consumed as corn on the cob, in which form it makes a profitable crop.

103. Intensively cultivated market gardens produce leaf vegetables, cucumbers, bitter cucumber, beans, tomatoes, and other vegetables of minor importance. In the Cameron Highlands the acreage of such vegetable gardens, almost entirely cultivated by Chinese, was 1,400 acres during 1958.

104. In Kedah, Kelantan, Trengganu and Pahang water melon is an important off season crop, and production expanded in 1958.

105. The acreage under bananas, largely as a catch crop in newly planted or replanted rubber increased in 1958 by 6,400 acres. The main producing States are Negri Sembilan and Johore, and much of the crop from these two States is sold to Singapore.

106. Fruit trees in mixed stands (*dusuns*) are a feature of every kampong in the country, and the total acreage throughout the Federation is estimated at 105,790 acres. Many of these mixed fruit trees are now old and becoming unproductive, and a replanting campaign is needed. Sales of selected fruit trees produced by the Department increased still further during the year, but demand still exceeds supply. A new but welcome feature in Malayan agriculture is the appearance of several intensively managed orchards, largely planted with selected rambutans and durians, or citrus of various types. This development should undoubtedly do much to relieve the shortage of good grade local fruit in a few years time.

107. The fruit harvests during the year were very good, and in many districts gluts of fruit developed. At the end of the year the rambutan harvest was particularly heavy.

(ix) COFFEE

108. The acreage under coffee increased further during the year to 14,840 acres, as compared with 14,210 acres at the end of 1957. The price of Liberica coffee, which is the only planted variety of importance, stood at \$150 to \$165 per picul in the middle of the year and at \$145 to \$150 at the end of the year. At present prices the crop is profitable, and there is room for a further increase in the acreage before the internal needs of the country are met. At present Liberica coffee produced in Africa is finding a ready market in Europe and America, and there seems no reason why Malaya should not develop a small export market.

(x) SPICES

109. Only arecanuts and pepper are of importance as export crops, and production of the former is contracting, while the area under pepper has remained constant. Other spices such as chillies, tumeric, ginger, sireh, nutmeg and clove are grown for

local consumption. There is quite a large trade in nutmeg and clove, but it is largely an import/export trade, and does not deal with local production.

(xi) TOBACCO

110. Tobacco is an important cash crop, largely grown as an off season crop on padi land, or, in Pahang, as a catch crop on land alienated for rubber. In spite of depressed prices, the acreage grown during the year did not decline. All tobacco produced in the Federation is consumed locally. The estimated acreage planted in 1958 was 6,300 compared with an estimate of 6,000 acres harvested in 1957.

(xii) MISCELLANEOUS CROPS

111. Other crops of minor importance which are grown include derris, patchouli, citronella, sugar palm, sago, nipah palm and various pulses.

C.—STOCK

(i) CATTLE, BUFFALOES, GOATS AND SHEEP

112. Although large numbers of livestock are kept in the Federation, they are raised and maintained with the minimum of trouble to the owners. Mixed farming, as it is known and practised in other parts of the world, does not occur in Malaya. In the main padi producing States, buffaloes and cattle are kept mainly for draught purposes, meat and milk being of secondary consideration. Elsewhere, buffaloes are kept in considerable numbers, and are used for meat production, although there is no intensive system of husbandry, the animals usually being allowed to roam at will, constituting a menace to cultivated areas. In many States large areas of land are reserved as grazing areas, but such areas are rarely used to the full, and are often allowed to revert to secondary jungle.

113. The production of fresh milk is conducted on a small scale, mainly by Indian farmers in the vicinity of large towns. Commonly such farmers own little or no land, their animals being allowed to find what rough grazing is available on road sides, or in the property of other persons.

114. Sheep are found in small numbers on the East Coast, and in Negri Sembilan. They are kept purely for meat production, and are never clipped for their wool. Goats are common in most areas, and in some areas constitute a menace to crops.

(ii) PIGS

115. With the improvement in the emergency situation, there has been a steady expansion of pig rearing. The popularity of the Middle White boar as a sire for crossing with local sows remains high, and in certain States almost all the porkers sent for slaughter have been of the local/Middle White cross. This situation has created a new problem, that of maintaining stocks of the local black pig in reasonably pure condition, and a start was made in the selection of nucleus herds during 1958.

(iii) POULTRY

116. The price of local eggs was depressed considerably during the year by the large imports of eggs through Singapore, originating in Hong Kong. As a result there was a reduction in the number of fowls kept, especially by the large intensive producers. Intensive production, in batteries or on deep litter, is still popular in Johore and Selangor, where there are large towns, and a ready market. Elsewhere, production of both eggs and table poultry is on the traditional free range, kampong system.

SECTION III

DEPARTMENT OF AGRICULTURE ORGANISATION AND ESTABLISHMENT

A.—ESTABLISHMENT

117. The establishment of the Department is shown in Table I. The number of posts for Professional Officers is 66. In establishment posts there were 23 vacancies at the close of the year, made up as follows:

Senior Entomologist	...	...	...	...	1
Senior Plant Pathologist	...	...	...	...	1
Botanists	...	...	...	...	2
Soils Chemist	...	...	...	...	1
Chemists	...	...	...	...	2
Canning Officer	...	...	...	...	1
Agricultural Engineers	...	...	...	...	2
Agricultural Officers	...	...	...	...	3
Agronomists	...	...	...	...	6
Senior Lecturers	...	...	...	...	3
Publications Officer	...	...	...	...	1

TABLE I

DEPARTMENT OF AGRICULTURE, 1958

ORGANISATION AND ESTABLISHMENT BY BRANCHES (EXCLUDING MINOR NON-TECHNICAL POSTS)

DIRECTOR					
DEPUTY DIRECTOR					
RESEARCH BRANCH	AGRONOMY BRANCH	FIELD BRANCH	PUBLICATIONS	EDUCATION	ADMINISTRATION
1 Assistant Director (Research)	1 Senior Agronomist	1 Assistant Director	1 Publications Officer	1 Principal, College	1 Administrative Officer
5 Heads of Division	13 Other Senior Officers	5 Senior Agricultural Officers, Grade "A,"	1 Librarian	4 Senior Lecturers	1 Executive Officer
2 Senior Research Officers, Grade "A,"	5 Non-Professional Senior Officers	2 Senior Agricultural Officers, Grade "B,"	4 Miscellaneous Technical Posts	1 Registrar and Bursar	1 Financial Assistant
3 Senior Research Officers, Grade "B,"	1 Assistant Statistician	14 Agricultural Officers		9 Agricultural Assistant Service Scheme Posts	30 Miscellaneous Clerical Posts
16 Other Senior Officers	1 Executive Officer	1 Agricultural Economist		4 Junior Agricultural Assistants	
1 Executive Officer	15 Agricultural Assistants	1 Personal Assistant		8 Miscellaneous Junior Posts	
2 Experimental Officers	58 Junior Agricultural Assistants	109 Agricultural Assistant Service Scheme Posts			
1 Assistant Statistician	8 Miscellaneous Junior Technical Posts	251 Junior Agricultural Assistant Service Scheme Posts			
27 Agricultural Assistant Service Scheme Posts					
56 Junior Agricultural Assistant Service Scheme Posts					
28 Miscellaneous Junior Technical Posts					
<i>Posts</i> 137	<i>Posts</i> 102	<i>Posts</i> 385	<i>Posts</i> 6	<i>Posts</i> 27	<i>Posts</i> 33

B.—SENIOR STAFF CHANGES

(i) BRANCH HEAD POSTS

118. (a) *Head Office (Administration)*.—Mr. R. G. Heath relinquished duty as Director with effect from 30th April, 1958, and Mr. P. G. Coleman, Deputy Director acted as Director from the same date.

119. Mr. H. J. Simpson, P.J.K., relinquished duty as Deputy Director with effect from 25th February, 1958. Mr. E. F. Allen, Assistant Director (Field) acted as Deputy Director with effect from 26th February, 1958, and relinquished duty thereof on 28th March, 1958. Mr. A. L. Barcroft, Assistant Director (Field) acted in the post of Deputy Director with effect from 29th March, 1958.

120. Mr. H. F. Logan relinquished duty as Administrative Officer with effect from 19th November, 1958.

121. (b) *Field Branch*.—Mr. A. L. Barcroft relinquished duty as Assistant Director (Field) on 28th March, 1958. Mr. H. D. Matheson, Senior Agricultural Officer, Grade "A", acted in the post from that date in addition to his duties as State Agricultural Officer, Selangor, until 1st December, 1958, when Mr. G. S. Keeping, Senior Agricultural Officer, Grade "A", took over as acting Assistant Director (Field).

122. Enche' Mohamad bin Jamil assumed duty as Agricultural Officer, Headquarters, with effect from 1st April, 1958. This post was upgraded to Senior Agricultural Officer with effect from 22nd July, 1958, and Enche' Mohamad bin Jamil has acted in it since that date.

123. (c) *Research Branch*.—Mr. A. Johnston, Senior Research Officer, Grade "A", acted as Assistant Director (Research) from 26th May, 1958 to 24th September, 1958, and Mr. F. B. Brown, Senior Research Officer, Grade "A", also acted in the same post from 25th September, 1958 to 24th November, 1958, vice Mr. J. K. Coulter who proceeded on leave. Mr. J. K. Coulter assumed duty of Assistant Director (Research) with effect from 25th November, 1958.

124. (d) *Education Branch*.—Mr. Chew Hong Jung, Botanist, acted as Principal, College of Agriculture from 1st January, 1958 to 15th June, 1958, and became the substantive holder of this post with effect from 10th June, 1958.

125. (e) *Agronomy Branch*.—Mr. R. Henderson, Senior Agricultural Officer, Grade "A", relinquished duty as acting Senior Agronomist on 17th April, 1958. Mr. C. Whitehead, Agronomist acted in the post from 18th April, 1958 to 17th July, 1958, and became the substantive holder thereof with effect from 18th July, 1958. Mr. G. I. M. Martin, Agronomist acted as Senior Agronomist from 2nd December, 1958 to 31st December, 1958, vice Mr. C. Whitehead who proceeded on annual leave.

(ii) RECRUITMENT

126. Mr. S. Selvadurai, B.A. (Hons.), was appointed Agricultural Economist on one year's probation with effect from

27th January, 1958, and proceeded to U.K. on Study Leave with effect from 22nd September, 1958.

127. Mr. Tan Teng Lai, B.A. (Hons.), Dip. Agric. Sci. was appointed Botanist on one year's probation with effect from 26th June, 1958.

128. Mr. I. Watson, B.Sc. (Hons.), was appointed Statistician on three years' contract with effect from 1st July, 1958.

129. Inche Mohd. Ridzuan bin Mohd. Noh, B.Sc. (Belfast), was appointed 2nd Year Pupil Agricultural Officer with effect from 22nd September, 1958.

130. Inche Ahmad bin Yunus, B.Sc. (Zoo), B.A. (Hons. in Agric. Zoology), was appointed 2nd Year Pupil Entomologist with effect from 24th October, 1958.

131. Mr. K. T. Joseph, B.Sc. (Agric.), M. Agric. Sci., was appointed Soils Chemist on three years' probation with effect from 6th September, 1958.

132. Mr. Au-Yong Kong Keong, B.Sc., B Agric. (Hons.), was appointed 2nd Year Pupil Agricultural Officer with effect from 4th November, 1958.

133. Mr. Ting Wen Poh, B.Sc. (Hons.), was appointed 1st Year Plant Pathologist with effect from 13th December, 1958.

(iii) RETIREMENTS

134. The following officers retired during the year :

- (1) Mr. R. G. Heath, B.Sc. (Agr.), A.I.C.T.A., Director of Agriculture, with effect from 3rd October, 1958.
- (2) Mr. H. J. Simpson, P.J.K., B.Sc. (Agr.), Deputy Director, with effect from 16th September, 1958.
- (3) Mr. E. F. Allen, B.A. Dip. Agr. Sci. (Cantab.), Assistant Director (Field) with effect from 10th September, 1958.
- (4) Mr. L. N. H. Larter, B.Sc. (Hons.), A.R.C.S., A.I.C.T.A., Assistant Director (Research) with effect from 23rd March, 1958.
- (5) Mr. R. Henderson, B.Sc. (Hons.), Dip. Agr. Sci. (Cantab.), Agricultural Officer, Grade A, with effect from 12th May, 1958.
- (6) Mr. J. R. Milburn, B.Sc. (Dunelm), D.T.A., State Agricultural Officer, with effect from 10th January, 1958.
- (7) Mr. J. J. Holmes, Publications Officer, with effect from 31st January, 1958.
- (8) Mr. M. G. Hawson, B. Agr. Sci., D.T.A., Agricultural Officer, with effect from 31st January, 1958.
- (9) Mr. D. W. N. Haynes, B.Sc. (Agr.) (Edin.), A.M.I.B.A.E., Agricultural Engineer, with effect from 3rd March, 1958.
- (10) Mr. C. R. Raper, B.Sc. (Agr.), D.T.A., Agronomist, with effect from 15th September, 1958.

(iv) ON LEAVE PRIOR TO RETIREMENT

135. The following officers were on leave prior to retirement:

Mr. F. B. Brown, B.Sc. (Hons.), Dip. Agr. Sci. (Cantab.),
Senior Research Officer, Grade "A".

Mr. A. Johnston, B.Sc. (Hons.), A.I.C.T.A., Senior Research
Officer, Grade "A".

Mr. H. F. Logan, Administrative Officer.

(v) PROMOTIONS

136. Mr. P. G. Coleman, Senior Agricultural Officer, Grade "A", was promoted to the post of Deputy Director, Super-scale "E", with effect from 1st March, 1958.

137. Mr. A. L. Barcroft, Senior Agricultural Officer, Grade "A", was promoted to the post of Assistant Director (Field) (Superscale "F") with effect from 29th March, 1958.

138. Mr. J. K. Coulter, Senior Research Officer, Grade "A", was promoted to the post of Assistant Director (Research) (Superscale "F") with effect from 1st January, 1958.

139. Mr. F. B. Brown, Senior Research Officer, Grade "B", was promoted to Senior Research Officer, Grade "A" (Superscale "G") with effect from 1st January, 1958.

140. Mr. F. N. G. Conaty, Senior Research Officer, Grade "B", was promoted to Senior Research Officer, Grade "A" (Superscale "G") with effect from 25th September, 1958.

141. Mr. A. R. McWalter, Senior Research Officer, Grade "B", was promoted to Senior Research Officer, Grade "A" (Superscale "G") with effect from 7th December, 1958.

142. Mr. C. Whitehead, Agronomist, was promoted to Senior Agronomist (Superscale "G") with effect from 18th July, 1958.

143. Mr. Chew Hong Jung, Botanist, was promoted to Principal, College of Agriculture (Superscale "G") with effect from 10th June, 1958.

144. Mr. T. R. Dickinson, Senior Agricultural Officer, Grade "B", was promoted to Senior Agricultural Officer, Grade "A" (Superscale "G") with effect from 1st March, 1958.

145. Mr. P. Class, Senior Agricultural Officer, Grade "B", was promoted to Senior Agricultural Officer, Grade "A" (Superscale "G") with effect from 29th March, 1958.

146. Mr. J. S. Ure, Agricultural Officer, was promoted to Senior Agricultural Officer, Grade "B" (Superscale "H") with effect from 29th March, 1958.

147. Che Wan Mohd. Don bin Mohd., Pupil Agricultural Officer, was promoted to Agricultural Officer on two years' probation, with effect from 7th November, 1958.

148. Che Mohd. Tamin bin Yeop, Pupil Agricultural Officer, was promoted to Agricultural Officer on one year's probation, with effect from 19th November, 1958.

149. Che Tak bin Haji Daud, P.J.K., Agricultural Assistant, Special Grade, was promoted to Agricultural Development Officer, with effect from 1st January, 1958.

(vi) LEAVE

150. The following officers were on leave at the close of the year:

Mr. J. L. B. Hitchcock, B.Sc. (Dunelm).

Mr. R. J. R. Barrett, B.A. (Hons.) (Cantab.), Dip. Agr. (Cantab.).

(vii) DEATH

The Director of Agriculture records with deep regret the death of Mr. Yoh Toh Kia, Cadet Agricultural Assistant of the Soils Division in the Research Branch, which occurred on 21st September, 1958, in the General Hospital, Kuala Lumpur.

SECTION IV

WORK OF THE DEPARTMENT OF AGRICULTURE

A.—RESEARCH AND INVESTIGATIONS

151. There has been steady progress in a number of research projects which have been under way for some years. Work on padi breeding and selection continued without interruption and addition of senior and junior staff under the Development plan is almost complete. This, with the increased acreage now available for padi breeding work at experiment stations, should lead to an acceleration of the programme. The emphasis on soil surveys has, of necessity, been changed from work on broad scale reconnaissance surveys in jungle areas to detailed and detailed-reconnaissance mapping of areas of the order of 2,000 to 10,000 acres for land development schemes. The impetus for a large number of such schemes in all parts of the country has arisen because of the various Government grants for land development which are now available.

152. The projects to study major and minor element nutrition of rice and cacao under the Colombo Plan, using sand culture techniques, were practically completed at the end of the year. The evolution of a satisfactory technique to induce and study deficiency symptoms of all the major and most of the minor elements in padi has been of considerable value. Three recent graduates were recruited to the Plant Protection Division and though this was partly offset by the retirement of the only experienced senior officer, satisfactory progress has been made in the work on control of stem borers, on the studies of foot rot in citrus and on the "unknown disease" of coconuts. Under the Colombo Plan a Japanese rice breeder started work on selection of improved strains from hybrids of local Indica and Japanese Japonica types. Studies on effects of air and soil temperature in the growth of padi were initiated. Further assistance under the Colombo Plan was provided by a Japanese entomologist stationed at Krian investigating the extent of stem borer damage and the effectiveness of various insecticides in checking pest infestation on young padi, particularly against *Chilo traea polychrysa* (Meyr.).

1.—PADI (RICE)

(i) *Variety Selection and Breeding.*

153. The programme of selection and breeding continued during 1958 without any major modifications. With the completion of inter-varietal testing of most of the popularly grown local varieties more attention was paid to testing selected strains and hybrids, both local and indica $\times$ japonica. On the whole the 1957/58 crop was most successful and yields in most cases were above average.

154. (a) *Variety Trials.*—A number of trials have been completed in Kelantan and Trengganu. A trial of Saigon varieties, with Siam 29 as control, has completed three seasons at Bachok Padi Test Station. Kadung Ket significantly outyielded the control by almost 500 lbs. per acre (18%), its mean yield being 3,122 lbs. per acre. On a soil such as that at Bachok this is highly satisfactory and it is proposed to test this variety on farmers' land.

155. Another trial designed to test the yielding capacity of Trengganu varieties has completed three years at Gelugor Padi Test Station. Of the eight varieties under test, Lembu Basah has given the best yield in any one year and has significantly outyielded the other varieties over the three year period. The mean yield of Lembu Basah over the three year period was 3,578 lb. per acre while that for Morak Sepilai was 3,135 lb. per acre and for Seraup Kěchil 2,901 lb. per acre. In another trial at Gerai Padi Test Station, Trengganu, ten medium to long term Trengganu varieties, which had done well in observation trials for a number of seasons, were put in a formal trial. Over the three years of the trial Morak Sepilai and Padang Trengganu gave the best yields and significantly outyielded five other varieties in the trial. Morak Sepilai gave a mean yield of 2,655 lb. per acre while Padang Trengganu gave a mean yield of 2,610 lb. and Siam 29 a mean yield of 1,996 lb. per acre.

156. (b) *Trials in Progress.*—At Sala Kanan Padi Test Station, Kedah, a trial with five varieties from Sarawak and the local standard variety Mayang Ebos 80 is under way. Over the two years the local variety has given good but not significantly better yields than the Sarawak varieties. Indai Empati and Engkatek were the highest yielding of the Sarawak varieties.

157. Indai Empati and Engkatek, one Siamese variety, Kao Pudart and two local varieties Nachin 39 and Subang Intan 117, have been under trial for two years at Kepala Batas Padi Test Station. Results so far indicate that there is very little difference in yields between the varieties.

158. The first year of a trial of five medium term varieties, Engkatek, Mayang Sesat, Radin Ebos 64, Siam 29 and Siam 76 at Hutang Kampong Padi Test Station indicates that Radin Ebos 64 (a new selection) has given significant yield increase over the other varieties. Though results are not conclusive they indicate that selected strains are better than unselected or old selected strains. Mean yields were 2,038 lb. per acre for Radin Ebos 64, 1,881 lb. per acre for Engkatek and 1,619 for Siam 29.

159. In a first year trial of eight Sarawak varieties at Telok Chengai Padi Experiment Station Engkatek gave the highest yield.

160. At Pulau Gadong Padi Experiment Station seven Sarawak varieties are compared with the local variety Siam 29. Of the Sarawak varieties Landak 21 has given the highest yield over the two year period but there was no significant difference between this and the control, Siam 29. In a similar trial at Jasin, Siam 29 outyielded all the Sarawak varieties though the differences were not significant.

161. The trials of Pahang varieties at Pahang Tua and Kerdu Padi Test Stations have completed two years but have shown no significant differences between yields of varieties, although Serendah Kuning (local) appears to be the most consistent high yielding variety.

162. The first year of the F.A.O. Co-operative Rice Varietal Trials has been completed at Telok Chengai and Pulau Gadong Padi Experiment Station but has given disappointing results. Most varieties have given very poor yields by Malayan standards. Four out of the original seven trials at Telok Chengai, which have given some results, were redesigned for further trials while the others were discontinued. At Pulau Gadong, all trials were discontinued and only seed lines have been grown for observation for assessment of suitable material for future breeding work.

163. (c) *Variety Survey*.—The collection of 1,244 Malayan varieties has been maintained at five Padi Experiment Stations.

164. New introductions include 71 varieties from the F.A.O. Regional Office, Bangkok and eight Burmese and eight Siamese varieties arranged through the State Agricultural Officer, Perlis. A number of American varieties were brought back from the U.S.A. after a visit by the Senior Agricultural Officer, Headquarters. Many of these American varieties had already been introduced but had shown no promise so they were again discarded. Those which have not been tried in Malaya will be grown during the 1959/60 season.

165. The ten Italian varieties, introduced in 1957, were planted at Kuala Lumpur, during both the main and off-season. All varieties are non-photosensitive and mature within 80 to 110 days. Some of the varieties have given promising results when grown in pots and observation lines and are to be planted at Bukit Merah next season in order to assess their value for double cropping.

166. (d) *Variety Selection*.—Pure line selection within 13 major padi varieties and one padi "tugalan" has continued. Selection of several of these varieties began in 1947 and 1948 and will be completed and seed distribution started in 1959 and 1960. Radin Ebos, on which selection started in 1947, is due for seed distribution in 1959. Similarly Seraup in Perak and Siam in Malacca, on which selection was started in 1948, are due for seed distribution in 1959 and 1960 respectively.

167. (e) *Trials of Pure Line Selections*.—(i) *Radin Ebos (Kedah)*. This trial has been in progress for four seasons and over the years the best of the selections (Radin Ebos 33) gave at least

8 per cent greater yield than the local controls. In another trial consisting of seven strains from mass selection and Radin Ebos 64, one of the best pedigree selection, R.E. 64 significantly outyielded the other strains in all three years. The average increase over the best of the mass selections is about 6 per cent. In this experiment mass selection has proved to be less effective than pedigree selection. In the first year of a series of trials of the best of the Radin Ebos selections, there is an indication that Radin Ebos 64 is a general purpose strain for the States of Perlis and Kedah.

168. (ii) *Nachin (Kedah)*.—Nachin selections have not proved as promising in the North as in Malacca. Over the three years of the trial at Telok Chengai only Nachin 39 gave a better yield than Mayang Ebos 80, the local control and this was not significant. It is unlikely that the Nachins will prove to be suitable in the Kedah region due to their weak straw and inferior milling quality.

169. (iii) *Seraup (North Perak, Penang and Province Wellesley)*.—The standard variety now grown, Seraup Kechil 48, has been outyielded by nearly all selections in all the trials. The three most promising selections are Seraup 50, 27 and 99. Seraup 27 and 50 appear to be general purpose strains which do equally well in all districts in Krian and Penang and Province Wellesley and have given yield increases of the order of 25 to 45 per cent over Seraup Kechil 48. Results are summarised in Table I.

TABLE I

Mean Yield in lb./acre

District	Mean Yield in lb./acre			
	Seraup Kechil 48	Seraup 27	Seraup 99	Seraup 50
North Krian ...	1967	2421	2596	2737
South Krian ...	1217	1823	1406	1725
Central Perak ...	1819	2421	1972	1857
South Perak ...	2220	2376	2761	2734
Penang/South Province				
Wellesley ...	2527	3244	2926	2902

170. (iv) *Serendah Kuning (Malacca and Negri Sembilan)*.—In a trial at Alor Gajah, laid down to assess the suitability of the new Serendah Kuning selections for the inland districts of Malacca, Serendah Kuning 30, 23 and 21 have significantly outyielded unselected Serendah Kuning by 27, 20 and 20 per cent respectively on a three year average. Actual yield increases were of the order of 400 to 500 lb. per acre.

171. In a second series of trials with Serendah Kuning selections at Ulu Klawang, Ampang Tinggi and Kendong Padi Test Stations in Negri Sembilan, two years of the trials have been completed. Serendah Kuning 30 and 48 are the best at Kendong and Serendah Kuning 60 at the other two stations. Serendah Kuning 11 continues to give good yields.

172. (v) *Anak Naga (Kelantan)*.—The first season of the final trial of the Anak Naga selections has been completed successfully. Selections of Anak Naga 21, 27, 39 and 47 have been the most consistent and gave yield increases over the unselected variety by about 15 per cent over the whole area. At Pasir Mas, Anak Naga 39 gave a yield of 3,676 lb. per acre compared to 2,776 lb. per acre from the unselected Anak Naga. At Kota Bahru, Anak Naga 27 gave 2,504 lb. per acre while the unselected variety gave 3,872 lb. per acre.

173. (vi) *Siam (Kedah, Malacca)*.—At Telok Chengai all selections, except two, gave increased yields over Siam 29. Significant increases were obtained from 11 selections; the best of them, Siam E.R. 16 and 25 gave 20 per cent better yield. They also lodged less than Siam 29. In Malacca no significant yield increases have been obtained but certain of the selections yielded as well as Siam 29 and have much stronger straw.

174. (f) *Extension Trials*.—(i) *Serendah Kuning*. Serendah Kuning 23 was tested at ten sites in Alor Gajah district and ten sites in Jasin district. An increase of 300 lb. per acre over the local variety was obtained in Alor Gajah and 150 lb. per acre in Jasin. This represents a theoretical increase of approximately 350,000 gantangs of padi in the inland districts of Malacca. In extension trials in Pahang, Serendah Kuning 31 gave a significant yield increase over the local varieties in five out of six sites in the Kuala Lipis district. The increase was of the order of 650 lb. per acre.

175. (ii) *Nachin*.—In 37 out of 39 sites in the coastal districts of Malacca, Nachin 39 gave higher yields than the local variety. In the Malacca coastal area the mean increase was 375 lb. per acre, in the Alor Gajah coastal area 675 lb. per acre and in the Central-West area 145 lb. per acre. These figures indicate that the exclusive use of Nachin 39 in the coastal areas would result in a theoretical increase of over one and a quarter million gantangs of padi.

176. (iii) *Radin Ebos*.—In Kedah the first year of an extension trial, using Radin Ebos 64, 41, Engatek and a local variety, has shown that over the 18 sites of the experiment, the local variety was outyielded by Radin Ebos 64 on 14 occasions, by Engkatek on 13 occasions and by Radin Ebos 41 on 9 occasions. However, there is no significant difference between the mean yields of these four varieties.

177. (iv) *Seraup Selections*.—Extension trials comparing Seraup 50 with the local variety (Machang or Seraup Kechil 48) were carried out on 30 sites in North Krian. Statistical analysis shows that Seraup 50 could be expected to outyield the local varieties in nine cases of ten under Krian conditions.

(ii) *Hybridisation*.

178. Four comparative yield trials of the oldest progenies of the indica $\times$ indica and indica $\times$ japonica hybrids which have reached a high degree of homozygosity were planted in 1958/59 season. During the 1957/58 season it was found that the Cuttack

hybrids (*indica* × *japonica*) in ear rows and progeny plots were more successful than the local hybrids at Telok Chengai but at Pulau Gadong the reverse was true. There is some evidence that the Cuttack hybrids may be more susceptible to stem-borer and “penyakit merah” than local varieties.

179. (a) *Indica* × *Japonica* Hybrids.—At Bukit Merah Padi Experiment Station, 12 *indica* × *japonica* hybrids, planted in the 1957 off-season, gave an average yield of 1,459 lb. per acre. The best hybrid (Pebifun × Serendah Kuning) yielded 2,474 lb./acre.

180. (b) *Hybrids of Local Varieties (indica* × *indica*).—Progeny plots of F_2 , F_6 , F_7 and F material were established at Pulau Gadong and Telok Chengai Padi Experiment Stations for the 1958/59 season. Homozygosity of the oldest generations is better than in the Cuttack hybrids of an equivalent age.

(iii) *Induced Mutations*

181. (a) *X-Rays*.—The fourth generation (X_4) progenies, consisting of 13 lines, are being maintained at Pulau Gadong Padi Experiment Station. It has been observed that fertility has been restored to almost normal in the X_3 progenies. Progenies planted during the off-season came into flowering 170 days from sowing. This indicates that the highly photosensitive nature of ordinary Siam 29 may have been affected by the X-Ray treatment. Further observation will be continued with both progenies and backcross progenies to obtain non-photosensitive mutant Siam 29, for incorporation in future breeding work.

182. The variety trial to compare the lodging resistance of the 13 lines of X_4 progenies with that of Siam 29 (a lodging variety) and Engetak (a non lodging variety) is to be continued at Malacca. Last season no differential lodging was recorded.

183. (b) *X-Ray Backcrosses*.—By backcrossing mutant Siam 29 progenies to normal Siam 29, fertility was restored without a reduction in resistance to lodging.

184. (c) *Polyploidy*.—This line of investigation has been discontinued. Seeds from last year's tetraploids were found to be empty and sterile and viable seeds were found to have reverted back to ordinary diploid.

(iv) *Nutritional Studies*

185. (a) *Penyakit Merah*.—In the past, the term “penyakit merah” has been used as a term to describe numerous disorders of padi. Investigations into the physiological, and especially nutritional, aspects of the disease were continued during the year. On the basis of previous work it was possible to set up a number of pot trials in which the effects of various fertilisers were tested on padi grown in soils representative of different padi-growing areas in the Federation. Some preliminary conclusions have been reached as a result of these pot trials, and these are to be verified in the field during the current (1958/59) season.

186. The leaf symptoms of “penyakit merah” fall into two broad types, the yellow or orange type and the medium to dark

brown type. In sand culture yellow to orange leaves can be induced by low P, Ca, N, Mg or Fe, providing that K is adequate or high, or by mild drying of the surface roots. The brown leaves can be induced by low K, Zn, or Mn, or by toxic quantities of certain elements. In the field, the yellow to orange leaves almost certainly appear because of the low availability in the soil of P, Ca or N, alone or in combination, or, in some years, periodic drying when the plants are young. It is not yet clear what causes the brown leaves, but all areas with brown leaves, which have been investigated, have proved to be deficient in Mn. It has not been shown whether addition of Mn can cure this symptom. It has been noted that in Mn deficiency the interveinal area of the leaf first turns light green or white and then brown.

187. In soils, the addition of P will increase, while Ca will invariably decrease the number of discoloured and dead leaves per tiller. However, both will increase yield. This suggests that the number of discoloured and dead leaves per tiller is not correlated with yield and therefore, in judging vegetative responses to fertiliser, emphasis should be more on tiller number and possibly number of green leaves, than on number of discoloured and dead leaves.

188. In soil pot trials the application of P invariably increased both tiller number and yield. The application of lime seldom increased and often decreased tiller number but it did increase yield. The reason for this effect is now being investigated.

189. In these pot trials, manganese was shown to be important and plants showed symptoms of manganese deficiency in the following soils:

- (1) Malacca (all three soils tested)
- (2) Bagan Serai
- (3) Kampong Kedah
- (4) Province Wellesley North.

Possibly Bruas and Changkat Jong could be included as Mn deficient areas but data on these areas is insufficient. Final data are available only for the Kampong Kedah and Bagan Serai soils and in these total tiller numbers on both soils and ear numbers on the Kampong Kedah soil were significantly increased by Mn treatment, though yields were not increased. This may have been due to insufficient Mn in the treatment (40 lb. MnSO_4 per acre). However, this rate of application did prevent the appearance of deficiency symptoms on the leaves.

190. Of lesser importance are Zn and B. Zn significantly increased yield on a Yen soil while B increased the number of ears, but not yield, in a Titi Serong Soil.

191. (b) *Minor Elements*.—A sand culture technique has been evolved by which it has been possible to induce and study deficiency symptoms of Fe, Mn and Zn on padi. Despite the most elaborate and refined techniques it was not possible to produce symptoms of B, Cu or Mo deficiencies though these same techniques were successful for these elements in the case of cocoa. Nutrient solutions containing 2 p.p.m. B produced symptoms of B

toxicity while Mn toxicity symptoms were obtained in solutions containing 8 p.p.m. Mn. On the other hand, a solution containing 16 p.p.m. Zn failed to produce Zn toxicity symptoms.

192. (c) *Water Control*.—The layout for this experiment, using concrete tanks, is described in the 1956 Annual Report. The main season (1957/58) crop again showed an overall increase in yield of padi from plots which were dry during the off-season. Results are given in Table II.

TABLE II

EFFECT OF OFF-SEASON TREATMENTS ON PADI-YIELD

Off-season Treatment	Main crop yield (gms./plant)		
	First season	Second season	
A—Wet—fallow ...	42	...	56
B—Dry—fallow ...	39	...	66
C—Wet—padi ...	42	...	50
D—Dry—tobacco chillies ... }	50	...	61

193. (d) *Uptake of Nutrients by Padi on Soils*.—(i) *Tank and Pot Experiments*.—In one experiment a *bris* soil from Kelantan which is used to grow wet or dry padi, depending on the elevation, is being studied in tank experiments. The treatments applied include a control, complete fertiliser (including trace elements) plus peat, complete fertiliser and complete fertiliser minus N, P, K, trace elements and Mg. in turn.

194. In another experiment, also being carried out in tanks, and using a poor padi soil from the Kuala Pilah district of Negri Sembilan, the effect of off-season cropping, with and without nitrogen fertiliser, on the growth of the padi, is being studied. Nitrogen is applied by split dressings of sulphate of ammonia, by spraying with urea or by application to the off-season crop. So far the indications are that a large application of nitrogen (about 100 lb. per acre of N) is necessary for good growth if all other elements are present in adequate amounts. It has been found that by applying nitrogen at fortnightly intervals symptoms of nitrogen deficiency do not develop. A dressing of 30 lb. per acre N applied partly as a basal dressing and partly as a top dressing, six weeks after transplanting, was inadequate to prevent symptoms of nitrogen deficiency developing.

195. (ii) *Leaf Analysis*.—The uptake of nutrients at various stages of growth, in high yielding padi areas at Sekinchang, has been compared with the uptake from lower yielding areas at Sungei Burong and Sawah Sempadan. All three areas are in Tanjong Karang. It has been found that:—

- (a) most of the nutrients are taken up during the first ten weeks after transplanting, nearly half the total amount of N and K in the plants at harvest and one quarter of the total P were taken up in the first six weeks.

(b) The addition of a limited amount of nitrogen at the sixth week after transplanting, as at present practised, is probably sound.

(c) Grain yield in the high yielding areas appears to be closely related to nitrogen uptake.

196. A small trial has been laid down at Ampang Tinggi, Negri Sembilan, the treatments being, control (no fertiliser) N, P, NP, NPK + lime + trace elements. The experiment is designed to find the best method of sampling padi plants for making fertiliser recommendations and to study the effect of large dressings of nitrogen. The plants are being sampled and analysed at monthly intervals. The indications so far are that P and N are both needed to improve the growth of padi in the area. In the treatment involving addition of complete nutrients it was found that nitrogen deficiency symptoms developed even after the addition of 60 lb. N per acre. A further addition of 30 lb. nitrogen rectified the deficiency. The plants receiving complete nutrients have many more tillers and are taller than the control.

197. (e) *Photoperiodic Effect of Flowering*.—A local indica variety (Siam 29) was sown at monthly intervals at the Pulau Gadong Padi Experiment Station, Malacca, which is on latitude $2^{\circ} 12'N$ and at Kota Bahru, Kelantan, which is $6^{\circ} 09'N$. The small difference in day length experienced at these two places was sufficient to effect the time taken for the padi ears to emerge. Evidence available, both outside and in Malaya, suggests that the shorter period from sowing to flowering in the higher latitude is due to the cumulative effect of longer nights during the critical phase of flower initiation. The results are given in Table III.

TABLE III
Days from sowing to ear emergence

	Day Length		Month (sown on first day)											
	Max.	Min.												
	Hr. Mn.	Hr. Mn.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
P. Gadong	12 14	12 00	329	311	—	232	214	199	187	168	161	172	—	205
K. Bahru..	12 28	11 47	266	276	272	217	203	175	153	141	128	128	135	138

(v) *Insects Pests.*

198. (a) *Stem-borer*.—The insecticidal control experiment carried out at various Padi Test Stations and noted in the 1957 Annual Report was continued in the 1957/58 Padi Season. Experiments were carried out at 19 Padi Test Stations distributed throughout the Federation. At eleven of these Stations Dieldrex 15 was used (where fish are not important) and D.D.T. was used at the remainder. Treatments consisting of (i) spraying at fortnightly intervals, (ii) spraying four weeks before flowering and (iii) control (no spraying).

199. In general stem-borer infestation during the 1957/58 season was low. The results indicated, however, that even when the

borer attack is low some loss in yield results. Infestation was high at five Stations and the results of experiments at these stations were analysed. Significant increases in yield were only obtained from fortnightly spraying and this increase was more pronounced at the two stations at which Dieldrex was used. Yield increases from the treatments would not be economic.

200. A survey of borer damage at flowering was carried out in all States except Johore, Negri Sembilan and Pahang. The results indicate that only in the Krian area of Perak and the Parit Satu area of Selangor was the infestation high. In the Parit Satu area the maximum percentage of bored tillers was 54.2 and in Krian 12.3; in all the other areas surveyed the percentage of bored tillers was below 10. This survey suggests that stem-borers are found in all parts of the country but that their seriousness is confined to certain areas.

201. An experiment to predict stem-borer outbreak failed because, in both areas where the experiment was laid down, stem-borer infestation was low. Pot experiments were set up at Headquarters to study the effect of D.D.T., endrin, dieldrin and diazinon on stem-borers. In the first experiment the insecticides were applied seven weeks after transplanting but it was found that this was much too late as the insecticides were virtually ineffective against those caterpillars already inside the padi stems. In the second experiment the time of spraying was brought forward and initial spraying was carried out six weeks after transplanting but this again proved too late. Based on this experience yet another experiment was set up using D.D.T., B.H.C., endrin, dieldrin, diazinon, malathion and rogor 40 and initial spraying was done two weeks after transplanting. This experiment is not yet complete.

(vi) Diseases.

202. No investigations on diseases were carried out during the year.

2.—OIL PALM

203. During 1958, the work at the Federal Experiment Station, Serdang, on pollination, seed germination and seedling distribution was gradually reduced and the second stage of the "Co-operative Breeding Scheme", which consists of the establishment of progeny trials on host estates, formed a large part of the work. No new work has been done on nutrition, but the work carried out in previous years on leaf analysis has been published. In an experiment on control of *Curvularia* seedling blight, captan proved effective.

(i) Breeding and Selection.

204. (a) *Breeding*.—Host estates carried out some pollinations on their own selected dura palms in accordance with a programme to compare the value of the various genetic stocks held by them. The aim of this programme is to provide tenera progenies with standard pisifera parentage and some of the pollen for this has been distributed by the Department. Some progress was made

with the establishment of a "Genetic Collection" on each of the four host estates by the distribution of seeds of *virescens*, *albescens*, *idolatrix* and *E. guineensis* × *melanococca* strains.

205. A total of 12 new trials and observations blocks were planted on host estates during the year and these were distributed as following :

Host Estate	Material under Trial	Acreage
Klanang Bahru	Dumpy and short dura ...	15
	Dura and Tenera ...	7
	Dumpy dura selfs...	13
	Genetic collection and miscellaneous ...	25
Ulu Remis ...	Dumpy and short dura ...	9
	Dura and tenera ...	17
	Semi-Dumpy and short dura	5 (+ estate origins)
Johore-Labis...	Dura and tenera ...	14
	Dumpy and short dura ...	20
Jendarata ...	Dumpy and short dura ...	21
	Dura and tenera ...	16
	Dumpy dura and selfs ...	9
Total acreage ...		171

206. (b) *Selection*.—The yield of oil from progeny trials. 0.1 and 0.2 at the Federal Experiment Station, Serdang, which were planted in 1937-38, showed little change over the previous year and progenies E.268 and E.211 continued as the highest yielders. Surprisingly, in palms of such age, the bunch number increased (14%) and bunch weight slightly decreased (10%) compared with 1957.

207. The Dumpy palms in trial, 0.3, were not given the complete "rest" from breeding work pollinations, which was intended, and yields were again a little low. Yields are given in Table IV.

TABLE IV

Elimina Dumpy and Dumpy × Tall Dura Observation Trial F.E.S., Serdang

			Oil (tons/acre estimated at 15% extraction)		
			1956	1957	1958
Dumpy palms	E. 206 × 206	...	1.1	1.0	0.9
Semi Dumpy palms	E. 152 × 206	...	0.9	0.9	1.0
Semi Dumpy palms	E. 206 × 268	...	1.1	1.0	0.9

208. The trial, 0.8, of six dura progenies at Federal Experiment Station, Jerangau, gave increased yields during 1958. The set of fruit on bunch was much improved following the adoption of a slightly more severe leaf-pruning technique.

209. Height measurements taken in November, 1958 (six years after planting) confirm that the highest yielding palms (D) are also the tallest. Progeny F (semi-Dumpy $\times$ Semi-Dumpy) is appreciably shorter than normal Serdang palms (E) but there is little or no evidence of segregation for "Dumpiness". Families A and B are also short but this may reflect their poor general growth on this soil rather than a genetically short habit. The yield figures tend to bear this out.

TABLE V

Dura Progeny Trial, 0.8, Federal Experiment Station, Jerangau,
Planted November, 1952

Progeny		Origin		F.F.B. (tons/acre)					Height at 6 years (ins. from ground to lowest bunch)
				1956	1957	1958	Means		
A	...	Soc. 6346	...	...	3.9	5.9	6.9	5.6	75
B	...	Soc. 1034	...	...	4.4	6.0	7.4	5.9	78
C	...	U.R. 220/4×261	...	...	4.1	7.0	8.1	6.4	83
D	...	U.R. 174/12×E. 63/17	...	...	5.3	7.6	7.7	6.9	100
E	...	Serd. 47/2×25/5	...	...	4.5	7.0	8.4	6.6	87
F	...	Serd. 14/2×10/8	...	...	4.1	7.5	8.1	6.6	76
M.S.D. at									
5%	...	—	...	...	0.9	1.1	N.S.	—	7

210. The unreplicated block of Dumpy-backcross palms, 0.4, growing on the coastal clay of a Selangor estate showed no increase in yield during 1958. Bunch rot, observed over several months of the year, may account for this. It is interesting to note that the control progeny of semi-Dumpy $\times$ semi-Dumpy palms has yielded least on this site and yet is among the highest yielding at Jerangau ("F" in Table V). Progeny 12.3 $\times$ 3.5 is poorer than 12.3 $\times$ 1.7 here, while the opposite is true in trial, 0.19, at Federal Experiment Station, Jerangau.

TABLE VI

Experiment, 0.4, Dumpy-backcross Progenies on Coastal Clay
Planted May, 1951

Progeny	Yield of F.F.B. (tons/acre)
<i>Semi-Dumpy</i> × <i>Dumpy</i>	
12.3 × 1.1 ...	8.8
14.2 × 1.1 ...	9.4
12.3 × 1.7 ...	10.2
14.2 × 1.7 ...	10.7
12.3 × 3.5 ...	9.7
14.2 × 3.5 ...	9.3
<i>Semi-Dumpy</i> × <i>Semi-Dumpy</i>	
14.2 × 10.8 ...	8.0

211. The yields are given in Table VII for another trial, 0.6, planted with palms of a similar origin to those in 0.4 but on a much poorer soil in Perak (upland soil).

TABLE VII
Experiment, 0.6, Dumpy-backcross Progenies on Upland Soil
Planted in November, 1951

Parentage	1958—Yield of F.F.B. (tons/acre)
<i>Semi-Dumpy</i> × <i>Dumpy</i>	
4.8 × 1.1	5.4
5.5 × 1.1	4.9
7.6 × 1.7	6.8
5.5 × 1.7	4.8
14.2 × 1.7	7.1
5.5 × 55.8	5.2
6.2 × 3.7	6.3
M.S.D. at 5 % pt.	1.0

212. In another trial (0.5) on the same estate the yield of Dumpy oil palms has shown an increase. However, compared with neighbouring fields of a similar age, their yield and bunch quality is poor.

213. It is now recognised that the young Dumpy palms descended from those at Serdang give poorer bunch quality and lower yields than dura palms of normal commercial origin of a similar age.

TABLE VIII
Comparative Yields of Young Dumpy-dura Palms and Dura
Palms of Normal Commercial Origin

Estate	Dumpy Palms			Estate Palms		
	Age (years)	F.F.B. (tons/acre)		Age (years)	F.F.B. (tons/acre)	
Estate A (Selangor)	6	2.4	...	6	9.2	
Estate B (Selangor)	6	4.2	...	7	9.3	
Estate C (Selangor)	6	4.1	...	10	7.5	
Estate D (Selangor)	6	4.5	...	6	6.8	
Estate E (Perak)	7	5.9	...	7	6.6	
Estate F (Johore)	6	2.7	...	6	6.7	
Estate G (Johore)	6	3.1	...	6	6.5	

214. There are only two formal trials in which Dumpy dura palms are compared with tall palms and in both of these the low yield of young Dumpy dura palms is shown [Tables IX (a) and IX (b)].

TABLE IX (a)

Experiment, 0.24, Dumpy and Estate Dura Palms Planted
October, 1952

Progeny	Pedigree	1958 Yield of F.F.B. (tons/acre)
Estate dura ...	298 × E. 117/1 ...	6.7
Dumpy dura ...	1.9 × 3.5 ...	3.2
" " ...	3.5 × 2.4 ...	2.4
" " ...	1.9 × 2.4 ...	2.4
" " ...	2.4 × 2.4 ...	2.8

TABLE IX (b)

Experiment, 0.17, Dumpy and Serdang Tall Dura Palms
Planted March, 1953

	Yield, May-December, 1958 F.F.B. (tons/acre)
Tall palms ...	2.6
Dumpy palms ...	1.8
M.S.D. at 5% pt. ...	0.6

215. The Department's first tenera progeny trial to come into bearing was 0.19, planted at Federal Experiment Station, Jerangau, in 1953. Yields for 1957 and 1958 are presented in Table X and are considered satisfactory. Bunch analysis data have not been prepared but examination of fruit types revealed that a high proportion of the palms are in fact tenera. However the fruit mesocarp in the dura progenies appears to be so thick that the comparative oil yields from dura and tenera progenies cannot be anticipated.

TABLE X

Experiment 0.19, Serdang Dura and Tenera Palms.
Planted December, 1953 (60 palm progenies)

	No. of Palms with identified Fruit Type		F.F.B. (tons/acre)	
	Dura	Tenera	1957	1958
A—Dumpy dura (2/4) × Nigerian pisifera (mixed)	8	52	4.9	8.0
B—Dumpy dura (1/7) × Serdang pisifera (27B)	13	45	4.5	6.9
C—Dumpy dura (3/5) × Serdang pisifera (27B)	4	55	5.0	8.4
D—Semi-Dumpy dura (12/3) × Dumpy dura (3/5)	59	0	4.4	6.9
E—Semi-Dumpy dura (12/3) × Dumpy dura (1/9)	56	0	2.3	5.2
F—Semi-Dumpy dura (12/3) × Dumpy dura (1/7)	59	0	3.6	6.7
M.S.D. at 5% pt. ...	...	—	0.9	1.5

216. The other tenera trial, 0.18, also planted at Jerangau in 1953, has produced startling results. Examination of fruit types showed that not one of the 72 supposedly "tenera" palms has actually produced teneral type fruits. There can be little doubt that the imported pollen used for breeding this material was not collected from a pisifera palm. Despite this the "dura-in-error" progenies yielded as well as the selected estate duras (Table XI).

TABLE XI
Experiment, 0.18, Estate Dura and Serdang "Tenera"
at Federal Experiment Station Jerangau
Planted in December, 1953

	F.F.B. (tons/acre)	
	1957	1958
U.R. dura (229/1 $\times$ 168/1)	2.4	6.5
" " (183/1 $\times$ 279/1)	2.1	4.9
Serdang "tenera" (41/1 $\times$ N.P. 1.1000) ...	2.5	6.9
" " (4/9 $\times$ N.P. 1.1000)	2.3	4.3
M.S.D. at 5 % pt.	N.S.	1.8

(ii) *Nutrition.*

217. No new research work on oil palm nutrition was carried out during the year. On yellowed palms with low magnesium content at the Federal Experiment Station, Serdang, application of 4 lb. per palm of magnesium sulphate was given in April, 1957, and analyses of fronds taken in December, 1957, showed no increase in the magnesium levels of frond 3 but an increase of almost 20 per cent in frond 17. A similar application of magnesium sulphate was applied in 1958 and the analyses of fronds taken in December, 1958, showed that the magnesium levels in frond 3 have now increased but those in frond 17 have actually dropped.

(iii) *Processing.*

218. Workers in West Africa have reported a relationship between oil content and moisture levels in the pericarp and examination of a series of fruits from botanical trials have confirmed that there is a similar relation in Malayan palms.

(iv) *Insect pests.*

219. No work has been carried out on insect pests and no serious outbreak of pests have been reported.

(v) *Diseases.*

220. An experiment on the control of *Curvularia* seedling blight of oil palms, carried out on a co-operative basis, on an estate in Johore, has been completed. Four fungicides, based respectively on TMTD, Captan, Zineb and copper oxychloride were compared. Captan gave the best results, treatment with this fungicide resulting in good control of the disease and in improved growth of the seedlings, as judged by the length of the longest frond.

221. A severe and widespread attack by *marasmius palmivorus*, which causes rotting of the fruit bunches, occurred on an estate in Selangor. Control is being obtained by severe pruning of affected trees and burning of diseased parts, together with treatment by a copper fungicide. Eradication of the disease is rendered difficult, because of the common occurrence of the fungus on oil palm debris on the ground.

222. An obscure disease of old oil palms occurred on an estate in Selangor. The outer fronds withered and died and this was followed by the death of the bud. Stem tissues of affected palms were abnormally soft and had a sour smell. The cause of the disease is unknown.

3.—COCONUTS

(i) *Breeding and Selection.*

223. At the Federal Experiment Station, Telok Bahru, the five progeny trials which, since 1956, have been progressively planted up with open pollinated seeds from selected palms at Port Swettenham, are now almost complete. The growth of the young palms in the field, which was extremely uneven initially, has been greatly improved by better drainage.

224. Some ten acres of the area reserved for the collection of estate selected seed were planted with self-pollinated material from a nearby Estate. Similar material from another Estate was in the nursery by the end of the year and supplies from other estates are expected during 1959.

(ii) *Nutrition*

225. No work on coconut nutrition has been undertaken.

(iii) *Pests.*

226. A trap breeding experiment was carried out in an estate in Selangor, the object being to observe whether insecticide-treated breeding pits would prove more attractive breeding sites for *Oryctes rhinoceros* than rotting rubber wood.

227. The results of this experiment showed that the pits were quite attractive to the beetles as breeding sites but the insecticides applied (BHC) had little effect in killing the grubs. The experiment is being repeated in the same locality and other insecticides are being tried.

(iv) *Diseases.*

228. Investigations into the unidentified disease of coconuts in the Batu Pahat area of Johore have continued. An attempt was made to discover, by culturing, if the disease is caused by a fungus or bacterium. Cultures were made from tissues taken from different levels of the stem of a diseased palm and also from the roots, but no pathogenic organism was isolated. With the co-operation of the field staff in the area monthly observations on diseased palms are being made with the object of obtaining more fundamental information on various aspects of the disease. When the disease was first reported in 1957, it was thought to be of recent origin as only small isolated groups of affected palms,

surrounded by healthy palms, were observed. More recently typical diseased palms have been noted on the edge of large spaces in which the coconuts had been killed in the past. This would indicate that the disease has been present for some considerable time. Records made so far show that affected palms are killed within approximately six months from the initial observation of the infection.

229. A disease of young coconuts, of which no previous record exists, has been noted in the Bagan Datoh area of Perak. Diseased palms are affected by a root rot which later extends into the base of the stem where it causes extensive discoloration and disintegration of the tissues. Affected palms show premature withering of the outer fronds which ultimately extends to the inner fronds and the palm dies. One fungus has been consistently isolated from diseased tissues and this has been provisionally identified as *Cylindrocladium scoparium*.

230. Stem bleeding was reported on an estate in Perak. The symptoms correspond closely to a disease caused by *Ceratostomella* sp., hitherto not recorded in Malaya. However, since this fungus was not obtained in culture, the identity of the causal organism could not be confirmed and the disease is still under investigation.

4.—PINEAPPLE

(i) *Breeding and Selection.*

231. At Jalan Kebun 67 clones from the Singapore Spanish selection were retained for further trial and it was recommended that the other material should be discarded. Discards were made on the following characters: non-fruiting types, excessively long maturation periods, undesirable fruit forms, spiny leaves, lack of vegetative vigour and susceptibility to pest attack. The 67 selected clones all possess fruits of good canning quality, short maturation periods, non-spiny leaves and large number of slips.

232. In the Sarawak selection programme, 19 plants have been retained for further trial and when sufficient planting material is available, they will be planted in larger observation plots at Alor Bukit. All plants produce slips and also form fruits of between three and five pounds.

233. The Taiwan hybrids and variety collection are being maintained under observation.

234. At Alor Bukit the Singapore Spanish collection was badly attacked by fruit rot and in addition recording has been hampered by Emergency conditions, so that the records are of doubtful reliability. It has been recommended that the present crop be replanted as a new foundation stock for selection of this variety. The 67 selected clones from Jalan Kebun will also be established in a trial at Alor Bukit.

235. From the records of the Australian Smooth Cayenne selection, it was possible to discard 525 plants and to select 77 clones for further trial. A new selection block will probably be established from the other material which has not been discarded.

(ii) *Nutrition.*

236. In sand culture it has been possible to induce symptoms of N, P, K, Ca. and Mg deficiencies in pineapple leaves. The experiment showed that it is necessary to use pots of at least 12" diameter and about that depth for satisfactory growing conditions. Potash deficiency symptoms were the first to appear, and this once again illustrates the high potash requirements of the plant.

(iii) *Canning Research.*

237. (a) *Fruit Quality.*—The work carried out over the past few years on the factors affecting fruit quality has been written up and is to be published under the title "Some Biochemical and Technological Studies on Local Pineapple".

238. An experiment, carried out in co-operation with the officers of the Malayan Pineapple Industry Board, showed that a canning syrup made from clarified juice and sugar gave an improved pack though there was an increase in cloudiness of the juice in the cans.

239. Fruit grown on peat soil and on mineral soils were canned for comparison and examined after six months storage. No significant differences in quality were noted. Samples of fruit from Taiwan hybrids have been analysed and some of the fruits have been canned. The canned product was superior to local varieties in colour, texture and flavour.

240. (b) *Paraffin off-flavour.*—Out of 1,969 cans examined, only four were found to have a slight paraffin off-flavour. This experiment, started in 1956, gave no conclusive results on the causes of this off-flavour in canned pineapples.

241. (c) *Pineapple Juice.*—Work on this has been confined to preparation of concentrated juice for examination by the Tropical Products Institute in London, more particularly for the determination of the flavouring constituents.

(iv) *Insect Pests.*

242. During the year two experiments were conducted on the control of mealy bugs. The object of the first experiment was to discover whether mealy bug wilt could be eliminated by fumigating the planting material from both healthy and wilted plants to rid it of mealy bugs and then spraying the soil with dieldrin to prevent entry of ants and mealy bugs into the experimental area. The experiment was unsuccessful and mealy bug wilt occurred on many plants.

243. In the second experiment, mealy bugs from affected and healthy plants in the field were transferred to the experimental plants and allowed to feed on them for 24 hours. The mealy bugs were then removed and the experimental plants kept free of mealy bugs during the remainder of the experiment. The object of this experiment was to determine whether mealy bug wilt was caused by the feeding and saliva of mealy bugs or by a virus transmitted by the mealy bugs. This experiment is still continuing.

5.—CACAO

244. Breeding and selection work carried out during the year was confined to the consolidation of experiments under way, and to the provision of pods of control pollinated hybrid seed for the establishment of observation blocks of Upper Amazon cacao in estates in Perak and Trengganu.

(i) *Selection.*

245. (a) *Amelonado*.—Although this variety has a high potential yield in Malaya it is susceptible to an unidentified cacao disorder ("die-back") which is prevalent in almost all cacao areas in the Federation. This disorder retarded growth and caused loss of crop wherever it occurred, particularly when it appeared in the highest yielding field at Federal Experiment Station, Serdang (Field 47A) in conjunction with an attack by leaf-eating caterpillars.

TABLE XII
Yields of Amelonado in Fields 44A and 47A at Federal
Experiment Station, Serdang

	Field	Acreage	Planting Distance	Planted	Approx. yield of Dry Cocoa lb./acre		
					1956	1957	1958
Serdang seed garden ..	44A/b	2.9	12'x12'	Mar. '50	150	265	143
Serdang Progeny Trial..	47A	0.3	10'x10'	Sep. '50	917	1,022	310

246. (b) *Trinitario*.—(i) *Indonesian*. The effects of "die-back" especially in plots which were previously rather unhealthy, were so severe that many trees were damaged beyond recovery. The trial can no longer be regarded as statistically valid. The severe drop in yield is shown in Table XIII.

TABLE XIII
Indonesian Trinitario
Planted September, 1950
Yield of Dry Cocoa in lb./acre at Estimated 40% Recovery

Variety	1956	1957	1958
A. Getas 8	843	659	351
B. Djaterongo I ...	850	617	391
C. Poerboyo Red ...	733	667	272
D. Poerboyo Green ...	745	737	254
E. Suzannasdaal ...	856	634	256
F. Amelonado ...	917	1,022	310

247. (ii) *Malayan*.—The relative resistances of the local near-Criollo variety to adverse conditions during 1958 has raised its mean yield over the last five years to almost equal that from Amelonado. (Table XIV).

TABLE XIV

Malayan Trinitario
Planted March, 1950

Yield of Dry Cocoa in lb./acre at Estimated 40% Recovery

	1954	1955	1956	1957	1958	Mean
Amelonado ...	353	452	308	501	178	448
Near-Criollo ...	201	412	265	511	306	424
Other Trinitario ...	145	280	172	377	191	291
M.S.D. at 5% ...	51	49	N.S.	N.S.	—	—

248. (iii) *West African*.—Although initial growth and yields from this have been very poor the field was almost unaffected by “die-back” so prevalent in the other fields at Federal Experiment Station, Serdang. In 1958 the crop was 3,525 pods from 2.5 acres as compared with 3,841 pods in 1957.

249. (iv) *New Guinea*.—These seedlings remained so poor during 1958 that it is not surprising that adverse conditions showed little effect on them. Crop was 112 pods from 0.9 acres compared with 157 pods in 1957.

250. (v) *Samoa*.—Growth and crop of this material at the Federal Experiment, Serdang, remained very poor.

251. (vi) *Trinidad and Grenada*.—No new imports were received, and there was no further propagation of selected clones already at the Federal Experiment Station, Serdang and Jerangau.

252. (c) *Upper Amazon*.—(i) *Progenies*. More than 70 per cent of the pods, from the plot of 39 seedlings at Serdang, were damaged or destroyed by rats and other mammalian pests. The trees were little affected by “die-back” but the actual crop harvested was very low, being only 204 pods, compared with 615 in 1957 and 715 in 1956.

253. (d) *Selection Trials*.—No new trials were established during 1958 and no results of importance from established trials are available.

(ii) *Breeding*.

254. (a) *Hybrids*.—(i) *Amelonado* × *Nanay 32*. The superiority of the hybrid seedlings over the inter-planted Amelonado was clearly demonstrated by the yield results. However, growth of the trees is very poor and the crop was far from satisfactory. No pods have been harvested from the Amelonado either in 1957 or 1958; 32 pods were harvested from 75 trees of the hybrid in 1957 and 92 in 1958.

255. (ii) *Amelonado* × *Malayan Trinitario*.—Only 72 pods were harvested from this plot of 60 trees.

256. (b) *Progeny Selection*.—No new trials were planted and no results of importance are yet available from established trials.

(iii) *Nutrition*.

257. (a) *Deficiency Symptoms of the Major Elements*.—In addition to the deficiency symptoms previously recorded for K, P

and Mg, it was possible to obtain leaf-symptoms of Ca and N deficiency in sand culture. These have been recorded by means of coloured photographs and drawings.

258. (b) *Deficiency symptoms of Minor Elements*.—By a refined sand culture technique, deficiency, symptoms of Zn, Cu, B, Fe and Mo were produced. Leaf analyses showed that plants in the —Mn treatment were relatively deficient in Mn but no leaf symptoms were obtained. Copper deficiency caused a temporary swelling of the main stem and a shortening of inter-node length, symptoms which have not previously been recorded for Cu deficiency. This work on the various deficiency symptoms is being published in a bulletin.

(iv) *Processing*.

259. (a) *Quesnel Fermentation Method*.—This procedure was used to prepare samples of chocolate for examination by Cadburys and by the Departmental tasting panel. In this method several podfuls of Amelonado cacao are mixed together to give a uniform batch. The beans are washed and then immersed in a solution of one per cent acetic acid and one per cent ethanol and allowed to ferment for 48 hours at 45°C. Three lots of cocoa were prepared by this method and the chocolate made from these was compared with controls made by the standard microfermentation method. Both Cadburys and the local panel of tasters agreed that the Quesnel method gave a slightly better quality chocolate.

260. (b) *Effect of Freezing Beans prior to Fermentation*.—This experiment was carried out in order to study the effects of killing the beans by freezing. Treatments were as follows:

1. Freeze for 24 hours at -12°C , then dry.
2. Dry in a current of air at 32° to 35°C , then freeze.
3. Dry in a current of air at 32° to 35°C .
4. Freeze for 24 hours at -12°C .
5. Chill for 24 hours at 4°C .
6. Control.

261. The results of this experiment showed that treatments 1 to 4 gave the better chocolate. A repetition of the experiment gave inconclusive results.

262. Examination of a sample of the frozen, dried and unfermented beans, under the microscope, showed that the pigment was diffused in a similar manner to that in unfermented beans. It would appear that the death of the beans by freezing does not prevent precursor development.

263. (c) *Drying Experiments*.—An experimental rotary cocoa dryer, built at the Federal Experiment Station, Serdang, has been used for experiments on the artificial drying of cocoa. Observations have been made on the speed of rotation of the drum at different gear settings, and on air temperature at several heater, air flow control and thermostat settings.

264. Several batches of wet fermented cocoa, each weighing about 80 lb. have been dried in the machine. Some difficulty has been experienced from the tendency of the beans to cluster into

a solid mass, which retarded drying. By greasing the inner parts of the machine, which come into contact with the cocoa, with an edible fat, the tendency of the beans to cluster was reduced considerably. It was found possible to dry cocoa in three days with this machine. When samples of artificially dried cocoa were tested against sundried control cocoa, the artificially dried material tasted more acid; this is a common complaint against cocoa dried in this manner. However, this "acidity" can be removed in chocolate preparation, during the operation known as "conching".

(v) *Insect Pests.*

265. (a) *Helopeltis*.—An experiment was carried out at the Federal Experiment Station, Serdang, on the use of D.D.T. fogging, D.D.T. spraying and Gammalin 20 spraying. Rates were 10 fl. ozs. a.i./acre, 2 fl. ozs. a.i./acre and 2 fl. ozs. a.i./acre, respectively. Four applications of each insecticide were given at fortnightly intervals followed by a fifth application four weeks after the fourth.

266. Results showed that there was a definite reduction of attack immediately after the first application of the insecticide. This reduction was noted in all treatments and also in the control plot. Even though large plots, of about an acre, are used in these experiments, a reduction in the control plots is almost always noted. The pest began to appear again four to five months after treatment.

267. In a second experiment also at the Federal Experiment Station, Serdang, two foggings with D.D.T., Gammalin 20 and Aldrex 2 were given at an interval of three weeks. After the first application of insecticide there was a gradual drop in infestation in Gammalin and Aldrex treated plots but the D.D.T. treated plot showed a very much slower drop. About five weeks after the second application of insecticides, the infestation showed an upward trend. The results of these experiments indicate that more than two applications of insecticide at fairly close intervals are needed if the pest is to be eliminated or reduced to a minimum.

268. In a similar type of experiment at Kampong Awak, Pahang, Aldrex 2, Dioldrex 15 and Gammalin 20 were applied by spraying at four fl. ozs. a.i./acre and also Gammalin 20 at two fl. ozs. a.i./acre. Two applications, a fortnight apart, were given. Results showed that the attack was reduced to a minimum and remained so for eight weeks, after which the experiment was discontinued.

269. In another experiment in the same area, Endrex was substituted for Gammalin 20 and again the attack was reduced to a minimum and remained so for about four months after the first application of the insecticides.

(vi) *Diseases.*

270. (a) *Die-back*.—Investigations, which were undertaken to determine if a viral pathogen was responsible for die-back, were brought to an end. In a series of experiments, evidence was

obtained to discount the theory that a mealy bug transmitted virus was responsible for the disease. These experiments showed that:

- (i) When mealy bugs obtained from diseased trees are applied to leaves and stems of healthy seedlings, only leaf chlorosis is obtained.
- (ii) Mealy bugs obtained from healthy trees produce a similar chlorosis on leaves of seedlings, thus showing that the leaf chlorosis in the first experiment is the result of a toxin or toxins secreted by the insects and not to a mealy bug transmitted virus.
- (iii) Attempts to transfer a mealy bug transmitted virus through one cotyledon of a cocoa seed were unsuccessful. One cotyledon with the radicle and plumule, was removed from a seed and mealy bugs allowed to feed on it. This was then planted, but during the growth of the seedling no pathogenic symptoms were noted.

271. Buds from die-back and healthy plants were grafted on to healthy cacao seedlings. Six successful unions were obtained on the controls but only two on test plants, out of a total of 20 plants in each series. In neither series was there any appearance of die-back. Further experiments might be undertaken to discover if the difference in the number of successful unions between control and test plants is of any significance.

272. Investigations to find a suitable medium for isolating the imperfect stage of *Calonectria rigidiuscula* from diseased stems are in progress. Of six media tried viz., Cassava Dextrose Agar, Prune Agar, Brown's Synthetic medium, Czapek's Dox Agar, Sabouraud's Agar and Potato Dextrose Agar, none proved successful. *Botryodiplodia theobromae* and a few other fungi were nearly always obtained from specimens of die-back stems. It is therefore hoped that in trying different media, one will be found which will suppress the growth of this fungus and permit that of *Calonectria rigidiuscula*.

6.—TEA

(i) *Insects Pests.*

273. (a) *Helopeltis*.—An experiment to control *Helopeltis* on tea at Cameron Highlands by fogging with DDT was concluded during the second quarter of 1958. Fogging was carried out on the day after each plucking. Results showed that fogging with DDT did not eliminate the pest and it appears that dusting might be more effective than fogging.

274. (b) *Other Pests*.—An infestation of the nettle grub, *Setora nitens* Walk., in lowland tea in Selangor was controlled by BHC spraying followed by hand collection of the larvae.

275. Two other pests of tea investigated during the year were a bagworm (*Clania* sp.) and a stem borer (*Xyleutes* sp.).

(ii) *Diseases.*

276. No research work on diseases was carried out during the year.

7.—FOOD CROPS

A.—Soya Beans

277. Following reports of poor germination of soya bean seeds at the Federal Experiment Station, Serdang, pot experiments on the effect of treating the seeds with fungicidal seed dressings were carried out. Results so far obtained indicate that germination can be improved by treating the seeds with an organic mercurial dressing or with a fungicide containing captan.

278. Only one crop was planted during 1958 in the three-year series of selection trials.

279. A number of experiments were conducted on the preparation of soya bean milk, soya bean curd and *tauge besar*. These were carried out in order to supply details for a leaflet on these products.

B.—Groundnut

280. At the conclusion of the series of variety trials it was found that the variety-season interaction had been so great that it was only possible to make a tentative selection of the best eight varieties out of the twenty tested. After bulking up, these eight varieties will be distributed for testing by State Agricultural Officers.

281. Experiments so far completed show that germination of groundnuts can be improved by treatment with seed dressings containing an organic mercury compound, or with Chloramil, Thiram, or captan.

C.—Tomato

282. (a) *Diseases*.—During the year experiments were conducted on the influence of various treatments and plants on the soil with regard to bacterial wilt. Flooding, soil fumigation, resistant root stocks and the influence of growing maize and padi were tried. p. sdan

283. Complete submersion of the soil with water for two months before planting tomatoes was successful to a certain degree against wilt.

284. Although grafting tomatoes on to resistant rootstocks (brinjals) was successful in preliminary pot trials, in the field the method was a failure as no unions were effected.

285. The following experiments are now in progress on bacterial wilt:

- (i) The effect of growing wet and dry padi before tomatoes.
- (ii) The effect of soil fumigation after harvest of wet and dry padi.
- (iii) Growing tomatoes and maize on land previously bearing maize.
- (iv) Growing tomatoes and maize, after soil fumigation on land previously bearing maize.

286. (b) *Processing*.—Since tomatoes, grown as an off-season crop, are in plentiful supply in some areas at certain times of the year experiments on canning were carried out. The fruit was harvested while still green and allowed to ripen, before canning as

tomato juice or whole peeled fruit in tomato juice. The fruit did not ripen to a uniform red colour and the resultant canned product, though of reasonable flavour, was of poor colour.

D.—Cabbage

287. During the year two experiments were conducted at the Federal Experiment Station, Cameron Highlands, on the use of diazinon and malathion, against the diamond-back moth, *Plutella maculipennis* Curt. Due to low incidence of the pest, the first experiment was abandoned. The second experiment was completed successfully and the preliminary analysis indicate that diazinon gives the better control, and consequently better yield.

E.—Miscellaneous Crops

288. In an experiment on pak choy seedlings at Cameron Highlands diazinon and malathion both gave excellent control of flea beetles, *Phyllotreta sinuata* Steph.

8.—TOBACCO

289. (a) *Bacterial Wilt*.—Experiments to control bacterial wilt in the Lenggong area of Perak gave little information because of the absence of the disease in that area during the trial.

290. (b) *Insect Pests*.—Larvae of the Noctuid moth, *Prodenia litura* F., caused some damage on tobacco in South Perak and control measures were recommended.

9.—SPICES AND DRUGS

A.—Cloves

291. *Sudden Death and Die-back*.—The observations, started in 1956, to study control of sudden death (*Valsa eugeniae*) and die-back (*Cryptosporella eugeniae*) have been continued. Recent inspections revealed no difference in the treated plots (mainly field hygiene and careful cutting out of diseased trees or parts of trees) and the control plots, where no such measures were taken.

B.—Derris

292. Examinations were carried out on derris roots, water extract of derris roots and water extract of derris roots after centrifuging, for a commercial firm which was interested in exporting the product as a concentrate. These examinations indicated that the water extracts were of little value.

10.—FRUIT

A.—Citrus

(i) *Pests*.

293. The citrus fruit borers, *Citripestis sagittiferella* Moore and *Prays endocarpa* Meyr., are a serious menace to citrus production and some preliminary examinations of these pests have been carried out with a view to starting experiments on their control.

(ii) *Diseases*.

294. Foot rot (*Phytophthora parasitica*) causes serious losses to mandarin oranges on low-lying, heavy soils, particularly in the Telok Anson area. The use of resistant root stocks is being

investigated and seedlings of possible species for use as root stocks have been established in pots, with a view to testing them for varietal susceptibility.

(iii) *Nutrition.*

295. Leaf mottling, which in severe cases is followed by formation of very small leaves and twig die-back has been observed in several mandarin orange orchards in Perak, Johore and Malacca. The symptoms suggest magnesium deficiency, and experiments on foliar spraying are being carried out. In a spray trial, using a mixture of zinc sulphate and slaked lime in the Segamat area, leaf chlorosis was cured.

B.—Durian

296. Preliminary observations on the natural pollination of durian flowers (*Durio zibethinus*) indicate that pollination generally takes place between 7 p.m. and dawn and the main cross-pollinating agent appears to be small bats. Controlled self and cross pollination provided some indications of an incompatibility system which would influence planting selected clonal material.

C.—Rambutan

(i) *Fruit Quality.*

297. Chemical examinations have been carried out to compare the quality of rambutans from the various clones. Fruits were analysed for soluble solids, sugars, acidity and pH. Fruit weight and the proportion of flesh, skin and seed in the various varieties were recorded. Canning trials have been carried out on the fruit from six clones, namely R.2, R.3, R.6, R.7, R.86 and R.89.

D.—Miscellaneous Fruits

298. In an experiment on making guava jelly it was found that fruits grown in Selangor had poor jelly making qualities, but that those from Johore were much superior. Chemical analysis of fruit showed that the Johore fruit was higher in acidity and pectins. Some preliminary experiments have been done on the extraction of guava juice in order to find a method which will retain the maximum amount of vitamin C in the juice. Ascorbic acid determinations have also been carried out on papaya, lime (*limau nipis*) and pomelo.

11.—COURSES IN CANNING AND PRESERVING

299. Five courses, each of ten days duration, were conducted during the year. Three of these courses were for members of the Womens' Institute and 19 of their students attended. The other two courses were conducted for R.I.D.A. and 16 of their students attended these. The courses were similar to those given in the previous year and included the following:

- (a) Principles of food sterilization by heat.
- (b) Preservation of foodstuffs in glass jars and cans.
- (c) Use of a pressure cooker.
- (d) Operation of a domestic can closing machine.
- (e) Preparation of jams and jellies.

12.—PASTURE, FODDER AND FEEDS

300. In connection with a guinea grass strains and spacing trial at the Federal Experiment Station, Serdang, 196 samples of grass were analysed.

301. Samples of cows' milk, spinach, rice and dried buffalo bone were sent to a scientist in Western Europe working on the strontium 90 levels in various foodstuffs.

13.—MISCELLANEOUS PESTS AND DISEASES

(i) Soil-borne.

302. An experiment to test the residual effect of dieldrin in soil against termites is now in its fourth year. The last mortality test showed that the concentration of the insecticide in the soil has been very much reduced. In a test on "Heraklith" and "Woodwool" slabs buried in a termite mound in May, 1958, only traces of termite attack appeared while a piece of meranti wood buried at the same time was more heavily attacked.

(ii) Stored Products.

303. A sample of Ryvita biscuits was examined and found to be infested by the saw-toothed grain weevil, *Oryzaephilus surinamensis* (L).

(iii) Quarantine.

304. A total of 285 examinations were made on planting material for export or import.

(iv) New Records.

305. The following insect pests and diseases were recorded during the year:

Host	Damage	Organism
<i>Dendrobium</i>	Leaves	<i>Lonchodes</i> sp.
Ferns (unidentified sp.) ...		<i>Pseudococcus adonidum</i> (L)
<i>Nephelium lappaceum</i> ...	Leaves	<i>Eboda celligera</i> Meyr.
" " " " " " " "	Fruit	<i>Demotina serraticollis</i> Baly
<i>Piper nigrum</i>	Leaves	<i>Smerinthothrips crassipes</i> Karny (Gynaikothrips)
<i>Oryza sativa</i>	Leaves	<i>Rivula innotabilis</i> Walk
<i>Artocarpus integra</i> ...	Leaves & Stem...	<i>Cephaleuros</i> sp.
+ <i>Gladiolus</i> sp.	Leaf spot	<i>Curvularia trifolii</i>
+ <i>Clerodendron paniculatum</i>	Rust on leaves...	<i>Aecidium superficiale</i>
<i>Indigofera teysmanni</i> ...	Stem rot	<i>Nectria</i> sp.
<i>Leersia hexandra</i>	Leaves	<i>Helminthosporium</i> sp.
+ <i>Panicum nodosum</i>	Rust on leaves...	<i>Uromyces leptodermus</i>
+ " " " " " " " "	Sooty mould on leaves	<i>Meliola panici</i>
<i>Nephelium lappaccum</i> ...	Die-back	<i>Giberella</i> sp.
+ <i>Rauwolfia serpentina</i> ...	Leaf spot	<i>Mycosphaerella</i> sp.
+ <i>Rosa</i> sp.	Leaf spot	<i>Mycosphaerella rosicola</i>

Fifty-three insect pests were sent to the British Museum for identification.

14.—MISCELLANEOUS ANALYSIS

306. Samples of peat wax were extracted and sent to the Tropical Products Institute in London for market appraisal. The preliminary report shows that this material has little commercial value.

307. In connection with germination experiments on oil palm seeds, permeability tests were carried out on polythene bags using oxygen and the analyses showed that oxygen can diffuse freely from these bags. Cabbages from Cameron Highlands were examined for insecticide residue (malathion and diazinon). Samples of soya bean curd were analysed for moisture, protein and fat. Examinations for the Trade Division of the Ministry of Commerce and Industry were carried out on samples of Egyptian rice, for cooking quality. Work on a suitable method for bleaching *bee hoon* was carried out for the same organisation. Lead arsenate residue on samples of tea leaves from Cameron Highlands was determined. Canned samples of banana puree, rambutan in syrup, papaya jam and beans in tomato sauce were examined for a commercial canning concern in Penang. A sample of so-called turpentine being used by a P.W.D. contractor was found to contain no turpentine.

15.—SOIL INVESTIGATIONS

308. With the arrival of a second soil surveyor it was possible to have two soil surveyors in the field most of the year. One soil surveyor, working in Kedah, has made good progress towards producing a reconnaissance soils map of the whole State. The soil survey in Kelantan was interrupted by the demand for soil surveys in various land development areas. The greatly increased pace of land development and the demand for soil surveys for the various land development schemes, which are being put forward by nearly all States, has necessitated a considerable change in the methods of soil survey. The initial selection of these areas is often far from satisfactory and it is now intended that the soil surveyors will concentrate on the production of a broad scale "draft schematic map" for the whole of the Federation. This map, which is planned for completion in 1962, should provide sufficient information about areas of undeveloped potential agricultural land for selection of suitable blocks for land development to be put on a much sounder basis.

(i) *Soil Sampling and Analysis.*

309. During the year 6,259 soil samples were received and on those approximately 26,000 analyses were carried out. A total of 1,991 plant samples were collected in connection with nutrition work and on these approximately 10,000 analyses were carried out.

310. (a) *Methods of Sampling.*—In alluvial soils, difficulty has been experienced in using an auger to obtain representative samples at depths greater than about 2 ft. A new type of auger has been devised; this consists of an external tube which can be screwed into the soil and an auger of slightly narrower diameter which

is used to take samples from within the outer tube. Using this apparatus it has been found possible to take samples to a considerable depth in the soft soil of the coastal alluvium.

311. In an attempt to speed up the progress of soil survey, particularly in areas for land development schemes a method has been evolved for taking undisturbed samples from the face of the soil inspection pits and then carefully placing them inside plastic beakers provided with air tight lids. These beakers, in special carrying boxes, are forwarded to Headquarters where the soils are broadly classified. This method, though in its initial stages, shows good agreement with the classification as determined by examination of the soils in the field.

312. In a study of the soil-forming processes at work in Malayan soils a very deep profile in a roadside cutting has been sampled and 19 separate samples taken to a depth of 9 feet. Detailed chemical and physical analyses are being carried out on these samples.

313. (b) *Soil Monoliths*.—The collection of soil monoliths now numbers over 60 and includes upland soil series from Kelantan, Trengganu and Kedah and padi soil series from Kedah and Kelantan. The monoliths are mounted in a moist condition in glass-fronted polythene-sealed cases. So far these monoliths have maintained their original structure and colour.

314. (c) *Methods of Analysis*.—(i) *Phosphorus*. A number of different extractants have been used to determine phosphate levels in soils developed over a range of parent materials in Kedah. In conjunction with this, a pot experiment using *Centrosema* as an indicator crop, has been set up to determine its phosphorus uptake. Estimations of total phosphorus in the samples taken from the deep profile, noted in para. (312) showed that the levels are of the order of 50-70 p.p.m. Total phosphorus in some of the Kedah padi soils ranged from 100 to 200 p.p.m. Such low values would indicate the advisability of determining total phosphorus as well as available phosphorus values.

315. (ii) *Cation Exchange Capacity*.—The various steps in the analytical procedure, using the semi-routine barium chloride method have been speeded-up. A new indicator (Cal-Red) has been introduced for the versenate titration of calcium and has proved to give a sharper end-point than murexide. A check has been carried out on the versenate determinations of calcium and magnesium by using the gravimetric method for calcium and back titration with thiosulphate, for magnesium. Very good agreement was obtained but on the other hand, determination of sodium and potassium by chemical methods gave very poor agreement with the routine flame photometer method.

316. Exchangeable cation determinations were carried out on soil samples under jungle and under cocoa at Jerangau Estate. In both cases the exchangeable cations were found to be extremely low and there was no difference under the different covers.

317. (iii) *Nitrogen*.—At Sekinchang, Sungei Burong, and Sawah Sempadan in the Tanjong Karang area, padi soils have

been sampled in the wet condition for determination of nitrogen. There are indications that the amount of available nitrogen is related to the depth of surface water. Less nitrogen is available when the water is deep (one to two feet) than when it is shallow. Fifteen days after transplanting, a rather critical period in the life of the padi plant, samples from Sungei Burong gave an average of 11 p.p.m. available nitrogen while those from Sekinchang gave an average of 45 p.p.m. No difference was found in the available phosphorus or potassium levels in wet soil samples from these two areas, yet the growth at Sekinchang was markedly better than that at Sungei Burong.

318. (iv) *Sulphate Determination*.—The present method of sulphate determination involves a gravimetric determination which, although accurate, is very slow. Swamp soil surveys often require many sulphate determinations and two new methods have been tried out in an effort to speed up the determination. Both methods involve the precipitation of sulphate with barium chloride solution, followed by back titration of the excess barium with versenate. In one method, a blank titration is done to allow for the cations present in the soil extract, while in the other method the cations are removed on an ion exchange resin prior to adding the barium chloride; both methods are promising.

319. (v) *Detailed Granulometric Analysis*.—Some preliminary work has been done on a method developed in Indonesia, for the detailed granulometric analysis of soils. In this, the 2 mm sieved "fine soil" is further divided into ten fractions, some by sieving and others by sedimentation. Results on Malayan soils are sufficiently promising to justify further investigation.

(ii) *Soil Surveys*.

320. (a) *Dryland Soil Surveys*.—(i) *Kelantan*. The reconnaissance soil survey which was discontinued before the 1957 monsoon was started again in Ulu Kelantan and a two week river trip in the Sungei Galas region was carried out in mid-September. The results of this reconnaissance were rather disappointing for it was found that most of the area, which appeared from the existing air-reconnaissance maps and aerial photographs to be reasonably flat and low-lying, was considerably more broken and steeply sloping than had been expected. Although the soils of this region are quite good the chief factor limiting agricultural development is the steep topography, slopes of 25° to 30° predominating even in areas with maximum elevation of less than 400 ft. Due to an early monsoon *rentis* examination in the Bukit Kemahang Forest Reserve had to be discontinued before completion.

321. (ii) *Trengganu*.—The reconnaissance soil survey report on the State of Trengganu, with a schematic soils map of the State and reconnaissance maps of several areas of more fertile soils, was prepared for publication and the completed Bulletin will be available early in 1959.

322. (iii) *Kedah*.—Reconnaissance soil surveying of the sedentary soils of Kedah was started in January when several areas, which the State Government wished to develop, were examined by detailed reconnaissance and reconnaissance method.

During these surveys a number of new soil series and associations were established. Reconnaissance soil surveys were carried out at Telui Kanan (30,000 acres), Sungei Laka (20,000 acres), the Pokok Sena/Naka/Kuala Nerang "triangle" (27,000 acres), Bukit Lada (10,000 acres), Sungei Sari (5,000 acres), Weng Valley (2,500 acres) and along the Naka-Nami Road (5,000 acres). From August onward activities were concentrated on the delineation of soil association boundaries, by means of reconnaissance traverses, in the Padang Terap, Kota Star and Kubang Pasu districts of North Kedah and road reconnaissances in the Sungei Muda, Sik and Baling districts and along the Kulim-Serdang-Selama roads. From the information gained during the 1958 field work a "Draft Schematic" soils map of Kedah has been drawn up. In this map the soils are grouped provisionally into nine associations and as a result of this work the pattern of soil distribution in Kedah is becoming clearer. Thus it has been found that the soils of the Padang Terap area are much below average fertility, while the best soils so far located in Kedah are in the Kubang Pasu District. Further work is necessary to delineate more accurately the soil association boundaries mapped so far. A provisional "relative fertility list" of the various soil series encountered in Kedah has been drawn up and pot experiments are being carried out as a check on the field appraisal of these soils.

323. At the request of Kedah State Government a number of areas proposed as Land Development Units were examined in greater detail; brief notes on these areas are given below:

(a) *Bukit Tembaga Land Development Scheme. (4,000 acres)*—

The main soil series present were Gajah Mati fine sandy loam (1,500 acres) which is well suited to rubber cultivation and Padang Besar and Tembaga series which were classified as being of "marginal" suitability for rubber cultivation.

(b) *Extension of Sungei Tian Area. (2,400 acres)*—

Approximately 2,400 acres were surveyed by detailed reconnaissance methods and most of the area was found to be suitable for development.

(c) *Bukit Selambau Land Development Area. (1,800 acres)*—

The main soil type present was Gajah Mati clay loam, regarded as a good rubber soil, and the area was reported as suitable for development.

(d) *Guar Napai Land Development Area. (1,400 acres)*—

The dominant soil type was Batu Lapan silty loam, one of the better soils of Kedah.

324. (iv) *Perlis*.—A reconnaissance survey was made of a 750 acre area at Sungei Chuchoh where it was found that the soils were of low fertility and the area was not recommended for development. The dominant soil group was the Padang Besar-Tembaga Association.

325. (v) *Pahang*.—A detailed-reconnaissance soil survey was made of the 14,000 acres of the proposed Sungei Bilut Land Development Scheme near Bentong. Some 9,800 acres of the area were considered suitable for cultivation of rubber or dusun while a further 1,100 acres were considered suitable for wet padi. A group of poor soils occurring in the centre of the area were not recommended for cultivation. The coverage given in this survey i.e., *rentis*² at intervals of rather less than $\frac{1}{4}$ mile, was sufficient to produce a map at a scale of $2\frac{1}{2}$ " to the mile, which is accurate enough for the location of village-sites, orchard and rubber blocks, etc. However, slight inaccuracies of soil boundaries are inevitable, even with this degree of coverage, because of the jungle cover. This survey has shown that it is not very practicable to carry out highly detailed soil surveys in the dense jungle. Should it become necessary, in the future, to carry out very detailed soil surveys of large blocks of land it is likely that the best method would be an initial detailed reconnaissance soil survey of the type carried out at Sungei Bilut, followed by detailed mapping of the soil boundaries after clearing the area.

326. A reconnaissance soil survey was carried out of a 5,000 acre site along the Maran-Temerloh Road. The area was found to be suitable for a development scheme involving cultivation of rubber as the major crop.

327. (vi) *Negri Sembilan*.—A detailed-reconnaissance soil survey, covering an area of approximately 17,000 acres, was carried out in the Labu, Jimah and Sendayan Forest Reserves. The soils, composed largely of Rengam fine sandy clay loam and Salak fine sandy loam, were found to be of above average fertility and suitable for cultivation of rubber and dusun. Apart from a steeply sloping section this area, being situated near Seremban, is of very easy access and is ideally suited for agricultural development.

328. A soil examination was carried out over some 1,500 acres of land, at present under lalang, in the Kongkoi area which is proposed for a smallholder's scheme. The area was gently undulating and the soil consisted almost entirely of Rengam series, one of the more fertile Malayan soils.

329. Drainage works have been completed in the Sungei Raya (Stage II) Drainage Scheme, which is intended for development under dryland crops. Due to the very acid subsoil it is anticipated that some initial difficulty may be encountered in the establishment of dryland crops, but it has been recommended that coconuts and coffee should be cultivated. If this scheme proves successful it will provide valuable experience for reclaiming other similar areas of which there is a large acreage in the country.

330. (vii) *Malacca*.—Short reconnaissance surveys were made of proposed development areas at Bukit Apit, Bukit Bruang Forest Reserve, Hutan Percha, Machap and Solok Menggong. Reports with maps were produced for the authorities concerned.

331. (viii) *Johore*.—An examination of two proposed sites for oil palm cultivation was carried out near Kulai. One area, covering about 2,000 acres, was found to consist of soil of mediocre fertility while the other area, consisting of about 4,000 acres, contained granite-derived soils of above average fertility. This latter area was recommended as being the more suitable site. Especially since it is bordered on three sides by jungle areas believed to consist of similar soils, thus allowing for considerable expansion of the scheme in the future.

332. A reconnaissance was also made of a 2,000 acre block of land near Endau which is intended for development by small-holders. Some very good Rengam series soil was found in the area and a slight adjustment of the area boundary was recommended, to include as much of this soil as possible and exclude a rather poorer soil occurring nearby.

333. (ix) *Province Wellesley*.—Soil sampling of Stages II and III of the proposed Juru-Jajawi drainage area has been completed. About 4,000 soil samples were taken and these are being examined visually in an attempt to classify the soils into series or groups for mapping. Sampling was carried out along lines about 4/5th of a mile apart, originally put in by the Drainage and Irrigation Department. Duplicate samples were taken at 200 foot intervals at depths of 0-6", 6-12", 18-24" and 30-36" with 1½" screw augers, and also at 2,000 foot intervals to the same depths with 6" diameter augers. By bulking the 1½" auger samples in lots of five it is hoped to study the variation which occurs in sampling these alluvial soils.

334. (x) *Perak*.—A reconnaissance was made of a proposed development scheme on Sungei Plus, near Sungei Siput. The soil was found to consist of Rengam sandy clay loam, which is considered to be suitable for rubber or dusun cultivation. However much of the land was too steep for cultivation and in order to assess how much of the area is actually suitable for development, further traverses are being made.

335. (b) *Padi Soil Surveys*.—(i) *Paya Besar, Kuantan, Pahang*.—This area was first visited by a soil surveyor and soil sampling was completed by an Agricultural Assistant. Analysis of the samples was completed during the year and a report issued. It was found that, of the 3,000 acres, approximately 600 acres contained more than one per cent of sulphur in the subsoil, while 1,350 acres appeared to be rather light-textured for padi cultivation. It was recommended that the latter area be planted with coconuts. The development of the sulphurous area will depend on the success of reclamation schemes in similar soils in other parts of the country.

336. (ii) *Changkat Jong Area, Perak*.—Soil sampling of Stage II was completed this year and a report issued. The soils appear to be generally suited for padi cultivation although a strip of peat and muck crosses the middle of the area. Plans showing variation in pH, available phosphate, potash, etc., accompanied the report.

337. (iii) *Sungei Semerak Area, Pasir Puteh, Kelantan*.—A number of traverses were made in this area, which the Drainage and Irrigation Department proposes to reclaim. The south of the area appears to consist largely of peat overlain by light coloured clay or sand. Further north the soil takes on the characteristics of the coastal “bris” soils. Further inspections are to be carried out during 1959.

338. (iv) *Kedah Coastal Plain*.—The soil survey of the Kedah Coastal Plain was continued and in an attempt to cover as large an area as possible in the limited field season, all available Soil Division personnel were engaged on the work. Five tractor-auger units were used and in order to facilitate supervision of the work straight line traverses were employed instead of actually following out the soil boundaries on the ground as was done in previous years. Some 65,000 acres was covered in this manner and a map at a scale of $2\frac{1}{2}$ " to one mile has been produced. Additional traverses will be necessary in parts of the area to fix some of the soil boundaries more accurately. It was found that whereas near the coast the soil pattern is relatively simple and the soil boundaries fairly easily placed, further inland, where the older river terrace soils occur, the pattern becomes rather complex and grouping some of the soil series into associations will probably be necessary. It is of interest to note that a distribution of soils similar to that observed in Kelantan is beginning to show up although, due to the finer texture of the soils, the pattern does not show up as clearly on aerial photographs as it does in Kelantan.

339. (v) *Kelantan Plain*.—Due to an increasing demand for surveys of upland areas proposed for development schemes, it was only possible for senior staff to spend a limited period in Kelantan on padi soil survey this season. Consequently most of the field season was devoted to systematic sampling of established soil series and checking tentative boundaries plotted during 1957 from aerial photographs.

B.—AGRONOMIC AND LIVESTOCK INVESTIGATIONS STAFF

340. The Agronomy Branch has been most seriously affected by losses of staff caused by premature retirement of expatriate officers in accordance with the policy of Malayanisation of the Government Services. The branch has an establishment of fourteen Division I professional officers. In 1957 nine of these posts were filled but in 1958, the number of posts effectively filled was reduced to three, i.e., approximately 21 per cent of the establishment. Only one of these three posts was filled by a local officer but towards the end of 1958, another Malayan pupil Agronomist was recruited raising the numbers of the Division I professional staff to approximately 29 per cent of the establishment.

341. These drastic losses in terms of staff have inevitably been reflected in a reduced output of work. A number of investigational projects have been put on a “care and maintenance” basis and it is indeed a credit to the non-professional staff that the existing framework of the branch has not disintegrated.

1.—CROPS

(A).—Padi

(i) Wet Padi

(a) *Mechanisation*

IMPLEMENTS

342. An improved animal drawn plough suitable for the cultivation of wet rice fields in Malaya has been developed. The prototype has the following attributes:

- (a) It is light and shaped so that it can be conveniently carried on the shoulder.
- (b) The frame is made of straight wood requiring a minimum of preparation.
- (c) Metal parts are of simple design and do not require machining.
- (d) It is cheap to manufacture and costs only (M) \$35.00.

343. Field trials carried out in two padi areas have indicated that under conditions specific to these areas the plough is capable of efficient performance. Good inversion has been achieved and the furrow slice is both fairly well broken and of greater width than that produced with the traditional plough. In view of these results further ploughs are being manufactured for extension trials in 1959 in all the major padi growing areas in the Federation.

344. The possibility of mechanising padi growing in Malaya is largely dependent on the development of machinery which can be used in small rice fields on holdings of limited size. Greater attention is now being paid to the development of small machines suitable for use in padi fields. One such machine which has been tested and to some extent adapted is the Merry Tiller. This machine is used for cultivation of padi fields in Japan, Taiwan and China. Tests indicated that the Merry Tiller was able to work with fairly satisfactory results on dry soil and on wet soil with a firm bottom. It tended to bog down in Gelam soil and on wet coastal clay soil where the mud was deep.

345. It was found that improvement could be achieved by fitting a large wheel and modifying both wheel and axle to prevent clogging with weeds. This improvement together with the use of 3 H.P. Clinton engine rather than the $2\frac{1}{2}$ H.P. Shibaura engine improved the machines capacity to pull a plough. The ploughing operation itself was unsatisfactory and fundamental changes in plough design appear to be necessary for improvement. Satisfactory land preparation was achieved by fitting a tine harrow followed by modified puddling wheels. Further development and investigation is planned for the 1959 season.

346. An Engineer from the National Institute of Agricultural Engineering of the United Kingdom arrived in Malaya at the end of the year. This Engineer is following up a project, the object of which is to design a padi threshing machine suitable for general use by smallholders in Malaya. Trials are being carried out in the Telok Chengai district of Kedah.

PADI MECHANISATION SCHEME

347. The Padi mechanisation scheme at Parit in the Trans Perak irrigation area was designed:

- (a) to indicate whether complete mechanisation of padi growing is feasible in Malaya and if so,
- (b) to determine the optimum size of a mechanised family unit farm which could be developed in new padi areas.

Complete mechanisation has been shown to be feasible but erratic supply of water and other difficulties have prevented detailed investigation of the size of unit farm.

348. The 1957/58 crop suffered as a consequence of periodic shortage of water. Improved internal irrigation arrangements assisted in distribution of the water available but prolonged shortage at crucial periods of growth resulted in serious loss of yield. The padi variety "Engkatek" selected for its suitability for mechanical cultivation and harvesting was grown. This variety is normally short and stiff strawed but on the better irrigated fields rank growth developed and lodging occurred. Average yield for the whole crop was 172 gantangs/acre although the yield from 10 bird proof cages each of .001 acre averaged 377 gantangs per acre.

349. In the off season a major programme of contour levelling was undertaken. Rather more than 40 acres have been dealt with in this manner and results have been very satisfactory. Complete internal control of irrigation water has been achieved in the levelled areas and these have been sown with padi for the 1958/59 season. Supplies of water to the scheme were adequate up to the end of the year and growth of the padi has been satisfactory.

350. Preliminary trials with soya bean as an off season crop for mechanical cultivation indicated that yields of 1,000 lb. per acre or more were possible using selected varieties. Yields of this order provide a gross return of approximately \$300 per acre in the retail market.

(b) Agronomy

351. There has been a noticeable reduction in the padi Agronomic research programme for 1958/59 as a result of staff shortage. Investigational work has been largely restricted to the States of Kedah and Penang. In the latter State a team of Colombo Plan Officers from Japan have been conducting agronomic investigations in conjunction with ourselves.

352. Agronomic trials in progress in both the 1957/58 season and in the 1958/59 season were designed mainly to answer certain problems in the manuring of wet padi. The more important trials deal with the nitrogen and phosphate requirements of normal and overaged seedlings, the optimum economic proportions of the major nutrients required by padi in the field and the relative economic efficiency of water soluble and insoluble forms of phosphatic fertiliser. In addition, investigation of the economic value of using limestone and appropriate proprietary fertilisers has

been carried out. The Colombo Plan team are also investigating some of these factors but are concentrating to some extent on developing the known advantages of placement of fertiliser. They are also testing the economic value of fertilisers of high silicon content under local conditions.

353. Certain aspects of management have received specific attention. These include detailed investigation of the effect on yield of differential spacing of padi plants, the most advantageous method of disposing of padi straw, the economic effects of double cropping and problems specific to the utilization of gelam soils. Other cultural aspects have been dealt with by the Colombo Plan officers at Bukit Merah Padi Experiment Station. These include nursery management trials, the effect of ridge cultivation in the padi field, the economic value of specific herbicides and an examination of the components of yield in the padi plant.

354. Some of the more important indications obtained from field investigations in 1957/58 are described below.

355. Fertiliser extension trials conducted on smallholders' fields in Kedah in accordance with F.A.O. advice are providing important and interesting information. In the 1957/58 season these trials were confined to three soil series in an attempt to eliminate one source of variation. In the 1958/59 season they were further restricted to two soil series. Increased local control has resulted in drastic reduction in experimental error. The co-efficient of variation due to method in the 1957/58 season i.e., between plots within fields, is of the order of 5 per cent while variation due to factors other than treatments i.e., between fields, are of the order of 3 per cent. Responses were obtained only from application of nitrogen. No response to phosphate has been obtained and this is thought to be due in part to application of Bat Guano or phosphatic fertiliser by farmers in previous seasons. Response to application of 30 lb. of nitrogen, while greater than that in the previous season, averaged only 316 lb. per acre. Taking into consideration the error variance and the cost of the nitrogenous fertiliser this response is only barely economic.

356. The most important feature learned as a result of these extension trials is that there is a need to increase the potential of the crop for response to fertiliser. The technique of experimentation has been proved to be satisfactory in that responses on farmers' land are indicated fairly accurately. These responses are at the present time too small to justify continuance of the trials. Detailed information has become available of the husbandry techniques adopted by the farmers in the area concerned. The adoption of improved techniques and standardisation of these appears to be a primary essential if increased response to fertiliser application in terms of padi yield is to be achieved. An appropriate investigation programme is being designed for the 1959/60 season to clarify certain of the issues involved.

357. A review of a series of three plot fertiliser extension trials carried out in most States over the period 1955-57, indicates that in most cases profitable yield increases are being obtained from the application of fertiliser mixtures. The mixtures under

test were of 30 : 30 : 15 and 30 : 50 : 15 composition. In the former, phosphate was supplied in soluble form as Double Superphosphate while in the latter phosphate in insoluble form was provided as the considerably cheaper Christmas Island Rock Phosphate. In both cases nitrogen was supplied as Sulphate of Ammonia and potash as Muriate of Potash. The indication from yield data is that the more expensive mixture containing Double Superphosphate is usually more profitable in the East Coast States and in Perak South, Selangor and Negri Sembilan. The cheaper mixture containing the rock phosphate tends to be more profitable in Perak Central and Malacca.

358. In a number of padi growing areas in Malaya it has been shown that water insoluble phosphatic fertilisers are more economic than water soluble phosphatic fertiliser. Rock phosphate obtained from different sources and other water insoluble phosphatic fertilisers have been tested for relative efficiency on an equivalent P_2O_5 basis. Profitable increases have been achieved from their use in the presence of nitrogen and potash but no significant differences between the various sources of water insoluble phosphate has been detected. There appears to be no justification for choosing other than the cheapest source of water insoluble phosphate which at present is Christmas Island Rock Phosphate.

359. A variety and manurial trial at Bukit Merah in Province Wellesley has been discontinued. This trial was designed to study the interaction of fertiliser response with different short term varieties. Three hybrids included in the trial continued to segregate and for this reason the trial was abandoned. The two varieties Radin Kling and Pebifun responded positively to application of N. and P.K. and to a greater extent to the interaction N.P.K. The average response to N.P.K. was only 360 lb. grain per acre however and this is barely economic.

360. It has been shown in formal trials conducted on a number of stations in Kedah that of three varieties tested at three different plant population rates, the variety Radin China 4 is invariably higher yielding than Anak Didek and Siam 29. For all three varieties a spacing of 9 in. $\times$ 9 in. (77,440 hills per acre) has proved to be superior in terms of yield of grain per acre, to spacings of 12 $\times$ 12 in. and 15 $\times$ 15 in. (i.e., 43,560 and 27,878 hills per acre respectively).

361. A further series of spacing and variety trials carried out at numerous centres confirms that close spacing of the order of 6 $\times$ 6 in. or 9 $\times$ 9 in. gave a high yield of grain but a reduced number of tillers. Plants spaced 15 $\times$ 15 in. and 18 $\times$ 18 in. gave a greater number of tillers but this was insufficient to make up for the smaller number of plants per acre and consequently resulted in reduced yield. The logical sequel to this investigation is to determine means of obtaining an increased number of tillers while maintaining a high plant population per unit area. Investigations are in hand to achieve this.

362. Two important trials have been laid down this year at Pulau Gadong Padi Experiment Station in Malacca. These are

concerned with transplanting density, the number of seedlings per hill and field manuring. The trials are complementary in effect. In one, four different spacings, in which a standard population density of 43,560 hills per acre is maintained, are compared, while in the other trial four different spacings are tested each representing a different fraction of 43,560 hills per acre. In both trials one, three or five seedlings per hill are compared. The plots are split for application of the standard Malacca field fertiliser (30 : 40 : 15) and no fertiliser.

363. Pilot investigations have been carried out in Kelantan to clarify the effect on yield of resowing overage nurseries with a slightly shorter term variety. In many areas the transplanting date is dependent on rainfall and in the event of this being inadequate, seedlings remain in the nursery after they have reached the optimum stage of development for transplanting. In such circumstances it is feasible that a shorter term variety transplanted at the correct time will have a greater yield potential than overaged seedlings of a longer term variety. Investigations have indicated that great care is needed in the selection of the variety to be used. The resown variety must mature at the same time as the greater bulk of the padi in the area if it is not to suffer excessive damage from rat and bird attack.

364. A long term experiment dealing with the economic and cultural aspects of disposal of padi straw tests the effect on yield of padi of removing the straw and stubble; spreading it over the land, burning it in situ and burning it and adding bat guano every 3 years in accordance with local practice. The latter treatment appears to be proving the most effective.

(ii) *Dry Padi.*

365. Shortage of senior staff precluded the continuation of agronomic investigational work on dry padi.

(B).—*Coconuts*

366. Work has continued at the coconut station at Telok Bahru. Additional material obtained from selected palms at the abandoned station at Port Swettenham has been established for the Botany Division. Unfortunately the nuts from the selected palms were rather small and in short supply and in consequence, selection of planting material in the nursery has been inadequate. An additional 25 acres of land has been cleared for planting in 1959.

367. Manurial observations on a coconut estate on heavy clay soil in Lower Perak continue to provide interesting information. A noticeable response in terms of vegetative growth of young palms is apparent as a result of applying nitrogen and phosphate. A response is also found to application of magnesium limestone but there is no apparent effect from applications of potash.

368. It was reported in 1957 that economic responses to application of a complete fertiliser had been achieved in a manurial trial laid down on old palms on smallholders' land in the coastal area of Trengganu. Yields in this trial fell off badly in 1958,

the 4th year after manuring had commenced. Responses to fertiliser while still definite were no longer economic. This is particularly disappointing as the full effect of manuring coconuts is usually most discernible during and after the 3rd year. The trial will be continued with a view to checking future responses and correlating these responses with seasonal change and other variable factors.

369. Manurial and varietal trials on poor inland soil have been continued. Manurial treatments have been carried but for only 2 years and definite responses are not yet apparent. A new manurial observation has been designed for an estate in the Dindings.

(C).—Fruit

370. It has not been possible to implement plans for new investigational work during the past year. No officer has been available for full time work on fruit, much less to specialise on different types of fruit.

(i) *Banana*.

371. A factorial manurial trial involving the Canary banana at the Federal Experiment Station, Cameron Highlands, has been continued. A collection of local varieties of banana has been re-established at the Federal Experiment Station, Serdang. Four species of *musa* are involved, namely varieties/hybrids of *Musa acuminata* and *Musa balbisiana* from which the edible bananas of Malaya have evolved and a few strains of *M. violascens* and *M. gracilis*.

(ii) *Rambutan*.

372. A number of variety trials are in progress. The pre-war, high quality selections R.7 and R.4 continue to outyield other varieties and these clones are now strongly recommended for extension purposes. An attempt has been made in conjunction with the Research Branch to correlate quality of flavour with total sugars; reducing sugars; acidity and pH. No accurate correlation was found and in consequence assessment of flavour quality by a tasting panel remains the basis of assessment.

373. Preparations for an additional, large scale, formal rambutan variety trial are in hand at the Federal Experiment Station, Serdang. Land has been cleared for this purpose and planting material is being prepared. A detailed clonal observation and demonstration has been laid down at Gelong Gajah Agricultural Station in Perak.

374. Rambutan trees grown on deep peat soil at the Federal Experiment Station at Jalan Kebun in Selangor are vastly superior in terms of vegetative growth to trees of equivalent age grown on mineral soils. Despite the development of a large head to the tree and relatively high water table the trees appear to be well anchored. The lateral development of root systems is greater than that on mineral soils and this probably accounts for the unexpected stability of the trees on this soil. The trees are in their 5th year and in 1958 came into general bearing for the first time. This is two years later than is usual for rambutan grown on mineral soils but yields were greater than those

expected from trees of similar age on mineral soil. Tree crops grown on deep peat soils usually suffer considerably as a result of soil shrinkage and consequent root exposure. There has been noticeable soil subsidence in the rambutan orchard at the Federal Experiment Station, Jalan Kebun, but this is not serious as yet and the crop is considered to be sufficiently promising to warrant close attention in the future.

(iii) *Durian*.

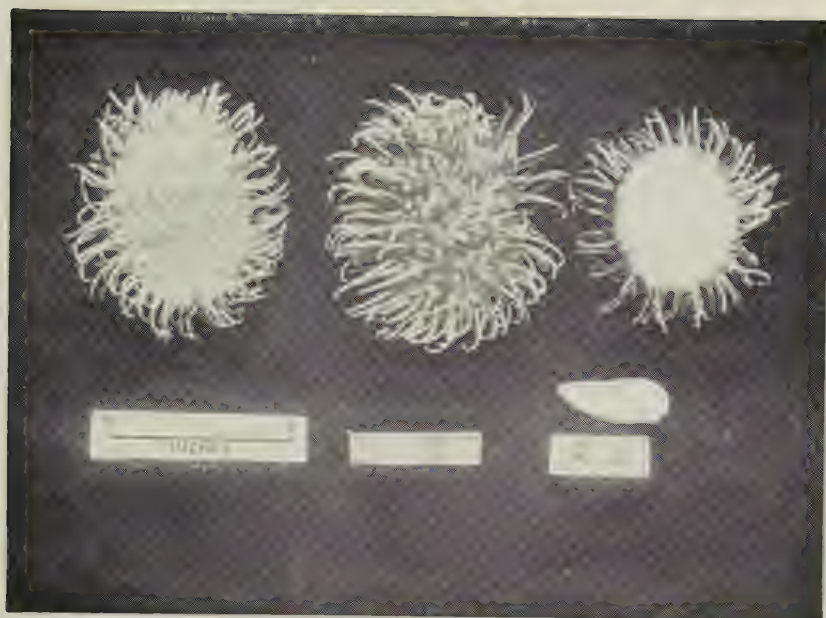
375. A variety trial at the Federal Experiment Station, Serdang, has this year produced its first major fruit crop. The trees were planted in the fall of 1948 and have come into bearing somewhat earlier than would be expected of seedling material. A number of rogues in the trial have been identified and fruit from all clones has been subject to standard tests for re-assessment of quality. The variety "Dato Nina" or D.2 is undoubtedly the most outstanding in this respect but there are a number of other clones in which the flavour of fruit has proved to be excellent.

376. The durian is normally grown in jungle or under semi-jungle conditions. Orchard cultivation in consequence presents certain unusual problems. Most important of these is the different growth habit. Trees under orchard conditions are distinctly pyramidal in shape whereas under jungle conditions the lower branches are self pruned and the bearing branches very high overhead. The non self pruning habit of orchard cultivated trees has resulted in the development of over-large weak branches which sometimes fracture at the point of junction with the trunk causing severe physical damage. It is clear that if durian is to be grown under orchard conditions—and this is not necessarily desirable—that a great deal of attention will need to be paid to pruning techniques.

(iv) *Citrus*.

377. Investigation is in hand to determine the most appropriate citrus rootstocks for use under local conditions. No information is available as yet, however, and investigation of the relative merits of selected varieties of Mandarin and sweet orange have not been initiated. To fill the gap until information is available, the extension services have been advised to consider the use of seedling material of a local neck orange called Limau Chembol. This is grown in the Northern states and in South Thailand. A brief survey of orchards in South Thailand has revealed a high degree of uniformity between seedling trees of Limau Chembol.

378. Pollen of *Poncirus trifoliata* has been imported from Australia with the intention of using this on Limau Chembol in order to mark the seedling progeny and in this way provide a more accurate assessment of the percentage apogamic seed produced. Unfortunately the pollen lost its viability in transit and cross pollination was not therefore possible. The considerable uniformity in fruit character from seedling trees both in Malaya and in Thailand suggests that the percentage of apogamic seed is very high and in the circumstances, extension using seedlings is thought to be justified.



Details of fruit characteristics are noted.



If the fruit is of good quality, budwood is obtained from the kampong *dusun* (orchard).



Budwood plant, as grown in budwood nurseries established throughout Malaya.



A heavy crop of high quality fruits obtained from a ten-year old Durian tree of a selected variety, grown at the Federal Experiment Station, Serdang.



Department officers visit kampongs to find good quality fruit.



Samples of fruit are sent to Federal Experiment Station, Serdang, for testing
The fruit illustrated are rambutans.



View of fruit rootstock beds at Federal Experiment Station, Serdang.



Budwood of selected varieties is grafted onto seedling rootstocks in the stock beds.



Using nursery budwood, orchards of high quality fruit are established. Rambutan trees, nine years old, at the Federal Experiment Station, Seiding

379. A formal grapefruit variety trial at the Federal Experiment Station, Gajah Mati, Kedah, is now in its second year. Seven selections on seedling pomelo rootstocks are being tested. Prolonged drought in the district towards the end of the year has caused the death of a few plants.

380. A rootstock observation has been started at the Federal Experiment Station, Gajah Mati, Kedah. This observation examines the reaction of a selected variety of each of five citrus species budgrafted into five rootstocks, together with marcots of all the scion species and seedlings of the local lime. The five scion species are selected clones of the local Mandarin orange; sweet orange; pomelo; grapefruit and the local lime. The five rootstocks used are:

<i>Citrus maxima</i>	...	...	...	pomelo
<i>Citrus paradisi</i>	...	...	...	grapefruit
<i>Citrus aurantifolia</i>	...	...	...	lime
<i>Citrus macroptera</i>				
<i>Citrus swinglei</i>				

Citrus swinglei has already proved itself to be unsatisfactory as a rootstock.

381. Preparations are in hand for a formal rootstock trial to be laid down at one or more centres in Malaya. Seed of a number of potential rootstocks has been obtained from Australia and these together with certain local species hybrids are being raised at the Federal Experiment Station, Serdang. Eleven species are available namely:

<i>Poncirus trifoliata</i>	...	...	Trifoliate orange
<i>Citrus limon</i>	...	...	Rough lemon
<i>Citrus sinensis</i>	...	...	Sweet orange
<i>Citrus</i> Sp. (?)	...	...	<i>Limau chembol</i>
<i>Citrus aurantium</i>	...	{	Sour orange
			Smooth seville
			Bitter sweet orange
<i>Citrus maxima</i>	...	...	Pomelo
<i>Citrus suhuiensis</i>	...	...	Mandarin orange
<i>Citrus</i> Sp. (?)	...	...	Wild lemon
<i>Citrus</i> Sp. (?)	...	...	<i>Limau gemok</i>

Isolated seed gardens of each of the imported strains are to be established.

(v) Pineapple.

382. The Malayan Pineapple industry board are in the process of taking over agronomic research on pineapple on deep peat soil. The majority of departmental agronomic investigations have been concluded and no new work on mineral soil has as yet been undertaken.

383. A review of the few investigations still in progress in 1958 indicates that mulching of pineapple on deep peat soil resulted in improved growth but no significant differences in terms of fruit yield. No differences in yield of fruit are as yet apparent in

a trial where both Singapore Spanish and Sarawak pineapple are planted under two densities of shade provided by *Pithecellobium clypearia*.

384. Two new manurial trials being carried out on "bris" soil in Kelantan have been abandoned as a consequence of staff shortage.

(D).—*Tea*

385. The more important agronomic investigations are being conducted at the Federal Experiment Station, Cameron Highlands and at the Federal Experiment Station, Serdang, on the plains. At both stations substantial progress has been made in assembling observation blocks of clonal tea. At the Federal Experiment Station, Serdang, 237 clones have been established and of these 60 clones are now in regular plucking. The more promising clones are in due course to be selected and put into variety trials.

386. A field investigation at the Federal Experiment Station, Cameron Highlands, tests the effect of adding increasing quantities of nitrogen fertiliser on the yield of plucked leaf. Nitrogen is applied at the rate of 0, 40 lb., 80 lb. and 120 lb. per acre. All treatments receive a base dressing of 30 lb. per acre each of P_2O_5 and K_2O . Yield increases in response to increased application of nitrogenous fertiliser in 1958 are linear in effect. Unchecked data for 1958 is as follows:

Yield in lb. made Tea January-December, 1958

Treatment		Calculated Yield Per Acre	
N_0	No nitrogenous fertiliser	...	623
N_1	40 lb. Nitrogen per acre	...	868
N_2	80 lb. " "	...	1110
N_3	120 lb. " "	...	1356

This represents an increase from a field in plucking throughout the year of about 245 lb. made tea per acre for each 40 lb. increment of added nitrogen.

387. Profitable increases in yield of green leaf have been obtained from applications of nitrogen and phosphate in an NPK_2^3 factorial manurial trial at the Federal Experiment Station, Cameron Highlands. The trial which is now in its second cycle has been in plucking throughout the year. Yield data obtained in the past year serves to confirm earlier reports that nitrogen and phosphate are more profitable when applied together than when applied separately. Relative data for the year under review has not yet been submitted to detailed examination. The following calculated yields however indicate the general trend:

Yield in lb./acre Made Tea January-December, 1958

Treatments	...	...	0	Nitrogen 80 lb. N/acre/annum	Mean
0	...	...	722	847	784
Phosphate 30 lb. P_2O_5 /acre/annum	...	...	835	1,054	944
Mean	...	...	778	950	864

388. A tea pruning and disease control trial at the Federal Experiment Station, Cameron Highlands, is now in the second year of its second cycle. Hard, medium and light pruning techniques form the main treatments. Plots are split for presence and absence of treatment during recovery from pruning with a proprietary fungicide dressing. Spraying with fungicide appears to have had no noticeable beneficial effect. Yield differences between pruning treatments are relatively small but there is some indication that light pruning results in a reduction in yield of leaf.

389. Observation plots of seedling and clonal tea have been established on volcanic soil at the Federal Experiment Station, Jerangau, Trengganu and on deep peat soil at the Federal Experiment Station, Jalan Kebun, Selangor.

(E).—*Coffee*

390. Trials have shown that to achieve reasonable vigour and growth of Liberian coffee grown on deep peat soil, potash and to a lesser extent the trace element copper need to be applied regularly. During 1958 a new factorial trial has been laid down on deep peat soil at the Federal Experiment Station, Jalan Kebun to further investigate the manurial and cultural requirements of Liberian coffee. This trial tests the simple effects and interaction of three levels of potash, the presence and absence of nitrogen and the presence and absence of a surface mulch all at three differing soil pH regimes. All trees receive copper four times a year applied as a foliar spray using Bordeaux mixture.

391. At the Federal Experiment Station, Cameron Highlands, a small Arabica coffee variety trial is in progress. Two varieties "Mysore" and "Blue Mountain" are compared. Growth and yield have improved in 1958 as a result of a change in manuring but yields are still low in comparison with those obtained in other countries. During 1958 the "Mysore arabica" gave a noticeably higher yield than "Blue Mountain".

392. Preparation is in hand for the establishment of blocks of Robusta and Liberian coffees on volcanic soils at the Federal Experiment Station, Jerangau, on the East Coast. These blocks are intended to clarify the relative economic values of the two types of coffee in this area.

(F).—*Tobacco*

393. No investigational work has been conducted on this crop as no senior technical staff have been available.

(G).—*Oil Palm*

394. Areas of palms at the Federal Experiment Stations, Jerangau and Serdang, were maintained for the Botany division of the research branch. No new agronomic investigations have been initiated as a result of shortage of senior staff.

395. Existing experiments have been maintained at the Federal Experiment Station, Serdang. In a long term replanting and manurial trial, palms replanted immediately after felling the original stand and one; two and three years before felling were

compared. Growth of palms planted after the original stand was felled were at first noticeably better than those in which the original stand had been left for varying lengths of time after replanting. Differences in appearance have now very largely evened out but yield differences are still noticeable.

Yield of Fruit Bunches in lb./acre for 1958
(Palms Planted in 1950-51)

Treatment	Yield
A Planted after felling	6,731
B Planted 1 year before felling ...	6,417
C Planted 2 years before felling ...	5,302
D Planted 3 years before felling ...	4,052

The most noticeable and consistent response to manurial treatments was a positive increase in yield due to application of muriate of potash.

396. It is now clear that oil palm has considerable potential in this district and it appears to be the most suitable crop for the immediate economic development of the area.

(H).—*Cacao*

397. The condition of cacao in the inland areas of Trengganu deteriorated very seriously in the early part of the year. Yellowing of the foliage, necrosis of the lamina, leaf fall and die-back were more serious than at any time previously. Attempts to link the incidence of leaf yellowing and die-back with cultural practice or variable factors other than rainfall have not been successful. There is however a strong indication of correlation with rainfall. The foliar symptoms described have in each of the past three years become more noticeable towards the end of the monsoon, while die-back of branches following leaf fall has been worst in the months following the end of the monsoon. This correlation is endorsed by the appearance of the symptoms as a serious factor only in the last three years. In each of these years the precipitation of rain in Trengganu during the monsoon has been unusually heavy. This aspect of the situation has given support to the theory that the cause of the trouble is malnutrition.

398. Investigation over the past few years has shown quite clearly that cacao grown in the Jerangau district of Trengganu and many other parts of Malaya suffers from a severe deficiency of calcium. It has also been demonstrated that application of calcium as a top dressing in the form of limestone while it enhances growth does not eliminate leaf yellowing and die-back. The possibility of other elements being deficient or present at toxic-levels has been fairly thoroughly investigated but no positive results have been obtained to date.

399. During 1958 attempts to establish seedling cacao in field trials at the Federal Experiment Station, Jerangau, met with little success, yet more mature cacao suffered less severely from leaf yellowing and die-back than nearby commercial areas. It is thought that the latter situation may be due to dressings of limestone

applied to many areas of the station in 1957 but the increasing difficulty experienced in establishing young cacao is as yet unexplained.

400. In view of the fact that in 1958 cacao at the Federal Experiment Station, Jerangau, exhibited a lesser intensity of die-back than commercial areas, the yield data therefrom cannot be taken as indicative of yields from commercial estates. The yield is nevertheless poor in comparison with areas of equivalent age in West Africa.

Yield of Amelonado Cacao in lb./Dry Bean/acre

(Conversion Factor 8.5 pods=1 lb. dry beans)

Age of Trees	Expected Yield	Actual Yield					
		FES. Serdang		FES. Jerangau Seed Garden			
		Fd 44a	Fd 46	A	B1	B2	C
4th Year ...	150 lb.	199	296	162	31	20	13
6th Year ...	400 lb.	127	253	319	178*	263*	123*
7th Year ...	550 lb.	226	408	385*	—	—	—
8th Year ...	700 lb.	121*	147*	—	—	—	—

401. The serious deterioration in the health of cacao grown in the monsoonal areas and the continued difficulty in clarifying the cause and providing an effective remedy, has resulted in the temporary withdrawal of departmental support for the planting of further cacao in Malaya. New manurial recommendations have been drafted as an interim measure for existing plantations. In these recommendations the repeated application of limestone is advocated.

402. Existing agronomic trials have been maintained. A manurial trial testing the nine factorial combinations of rock phosphate and magnesium limestone, each absent and at single and double levels of application continues to indicate a linear growth response to limestone and a curvature effect to phosphate application. There is a complimentary effect at single levels of each but this is less marked at the double level. Revised manurial recommendations now in force are based very largely on the results of this trial.

403. A 2⁵ factorial trial involving the elements N.P.K. Ca. and Mg. has not as yet yielded information which has not been obtained from other trials. Plots in the trial were split for application of manganese as foliar spray but no noticeable response has been obtained.

404. Investigation of the effect on seedlings of trace element deficiencies/toxicities were carried out at the Federal Experiment Station, Jerangau, in 1958. Symptoms of calcium deficiency were produced which closely resembled symptoms appearing in the field. No other symptoms produced could be accurately linked with symptoms appearing in the nursery or the field.

* Yield in 1958

405. An observation has been laid down at the Federal Experiment Station, Jerangau, to compare the effect on the incidence of die-back, growth and yield of cacao of clean weeding, mulching and the present system of allowing the fields to remain under natural weed growth. Another set of observations has been laid down to determine the most suitable methods of eradicating the natural weed growth. Sodium chlorate has proved to be the most effective general weed killer employed. Dalapon used at rates of 10 lb. per acre and over in areas where grass weed predominated caused yellowing and drop of cacao leaves.

406. A pruning observation at the Federal Experiment Station, Serdang, has been continued. Pruned trees have single trunks and a single storeyed canopy. The development of unpruned trees is not controlled in any way. Access to fields of unpruned trees is particularly difficult. Yields in 1958, the first bearing year, indicated that a slightly greater yield had been obtained from the unpruned trees.

407. A Cameroon type cocoa drier at the Federal Experiment Station, Jerangau, has proved to be satisfactory in operation. This type of drier is suitable for use by smallholders.

(1).—*Vegetable and Food Crops*

408. Existing investigations have been maintained at the Federal Experiment Stations, Cameron Highlands and Serdang. No new work has been undertaken as a result of shortage of senior staff.

409. A long term vegetable manurial trial at the Federal Experiment Station, Cameron Highlands, is now in its 6th cycle. Three crops, namely Cabbage, lobak (Chinese radish) and French beans are normally grown each year of the cycle. Unfortunately germination of the lobak this year was poor and the crop had to be resown. The delay made it necessary to drop the third crop in the 1958 cycle.

410. The purpose of the trial is to find a vegetable fertiliser dressing which is cheaper but not less effective than the traditionally used prawn dust. The latter is both expensive and attracts flies. Yields obtained are as follows:

Yield in lb. per 1/25th acre (approximately)

Crop	A 5 tons Prawn dust + $\frac{1}{2}$ ton ground lime- stone/acre/annum	B 3 tons sterameal, 238 lb. sulphate of ammonia, 450 lb. double superphosphate 100 lb. common salt and $\frac{1}{2}$ ton ground magnesium limestone all per acre per annum	C 3 tons bean cake and inorganics as at B + 312 lb. sulphate of potash and 200 lb. muriate of potash per acre per annum
Cabbage	1682	2277	2374
Lobak	879	1195	1263

It can be seen from the results that both mixtures B and C were more effective than prawn dust. Both B and C are considerably less expensive than prawn dust.

411. A long term observation designed to clarify the effect of continuous arable cropping and arable cropping alternating with fodder grass ley is in progress at the Federal Experiment Station, Serdang.

412. Three arable crops a year are carried, namely, maize, sweet potatoes and groundnuts. Guinea grass *Panicum maximum* is used as the fodder grass and alternates with arable crops in the appropriate treatment over 2-year periods. Each main treatment is sub-divided to provide for the presence and absence of inorganic fertiliser supplement.

413. The guinea grass was ploughed out in 1957. Yields for the 1957/58 season are as follows:

Calculated Yield in lb. per acre of Dry Grain, Fresh Tubers
or Shelled Nuts

Year	Crop	Continuous Arable Cropping		Alternate Husbandry	
		Without inorganics	With inorganics	Without inorganics	With inorganics
No. 7 1957/58	Maize ...	500	620	568	468
	Sweet potato ...	15,336	20,768	15,560	17,888
	Groundnut ...	856	616	608	740

Yield of maize is particularly poor. The lower yield recorded from the alternate husbandry plot receiving inorganic supplement has not been explained.

414. A series of formal maize variety trials are in progress at the Federal Experiment Station, Serdang. These are intended to indicate the relative merits in terms of yield and resistance to rust of certain imported hybrids and local flint. Soya bean variety trials have been carried out for the research branch.

(J).—Fodders and Pastures

(i) Fodder Crops.

415. Results from a 33 factorial manurial trial with guinea grass at the Federal Experiment Station, Serdang, have shown that despite the use of farmyard manure as a treatment, yields in the second year after establishment have fallen substantially. A linear response has been obtained from the application of both farmyard manure and an NK fertiliser dressing. The highest yield was approximately 56 tons of fresh cut guinea grass, obtained as in the previous year from plots receiving dressings in acreage equivalents of 25 tons of farmyard manure 9 cwt. sulphate of ammonia, 6 cwt. muriate of potash and 3 cwt. of rock phosphate.

416. A guinea grass variety and spacing trial in progress at the Federal Experiment Station, Serdang, is designed to compare the yield at varying planting distances of six imported varieties and the local strain. The varieties differ in their earliness of flowering after each harvest. The highest yielding strain was Kenya K.51270F (Sigor) followed by the late flowering Tanganyika (short).

417. A number of imported species of fodder grasses are under examination at the Federal Experiment Stations, Kuala Lumpur and Serdang. One of the species selected, *Panicum*

trichocladum yielded 83 tons per acre in its first year but in its second year yields fell away to 38 tons per acre. Further reduction in yield has since become apparent and it is clear that the grass is not sufficiently persistent for local requirements. *Brachiaria brizantha*, another selection, has yielded approximately 76 tons of fresh cut grass per acre in its first year. Yields in the second year promise well and the grass has stood up well to strip grazing.

418. A number of leguminous and other fodder crops are under observation at the Federal Experiment Stations, Serdang, Kuala Lumpur and Cameron Highlands.

(ii) Pastures.

419. The 3³ N.P.K. factorial manurial trial at the Federal Experiment Station, Serdang, has been continued. This trial is conducted on *Axonopus compressus* grown under the shade of *Enterolobium samaan*. Mean yields are in the region of 18 tons of fresh cut grass per acre. The main response continues to be to nitrogen with a lesser response to potash. No satisfactory method of grazing evaluation of the manurial effects has been worked out and none in fact seems possible.

420. The pasture shade and variety trial at Serdang continues in modified form. The grasses *Axonopus compressus* and *Axonopus affinis* are manured in accordance with standard practice. Shade is provided on the appropriate plots by *Enterolobium samaan*. Yields are determined from sample cuts of 30 days regrowth prior to grazing. Grazing is rotational and growth during the grazing period is not recorded. Yield recorded in this fashion, while it does not provide a proper determination of grass production, permits comparison of yields of 30-day regrowth after grazing.

Estimated Yield in Tons Cut Grass Per Acre

Grass Species		Shade		No Shade
<i>Axonopus affinis</i>	...	9.7	...	6.3
<i>Axonopus compressus</i>	...	11.9	...	5.5

Stocking rate during the year was approximately 2.5 head per acre.

2.—LIVESTOCK

421. No new investigations have been conducted due to the shortage of senior staff.

(A).—Goats

422. Production of high grade Anglo-Nubian goats has continued. High grade bucks have been distributed to State Agricultural Officers for extension purposes.

(B).—Pigs

423. The feeding trial at the Federal Experiment Station, Serdang, has been continued. The trial is designed to test the relative merits of feeding a high concentrate ration with a cheaper, suitable, local modification of the ration designed by Lehman in which only basic requirements in terms of concentrate are provided—the balance being made up with bulky foods. 11 replications have now been completed and a further three are in

progress at the end of the year. There continues to be little difference between pigs reared on the two systems in terms of growth rate, carcase quality or efficiency of food conversion.

(C).—Cattle

424. The Bali herd at the Federal Experiment Station, Serdang, has been maintained in good health. The herd now consists of four bulls, eight bull castrates, 15 cows and 24 heifer calves.

C.—EXTENSION AND ADVISORY WORK

1.—CROPS

(A).—Rubber

425. The area of rubber smallholdings in the Federation is estimated to be about 1.6 million acres, although this figure is probably a conservative estimate. The field staff of the Department co-operates closely with the staff of the Rubber Research Institute of Malaya to ensure that smallholders are kept advised of the latest methods of maintenance generally, of pest control, tapping techniques, anti-erosion methods and manuring.

426. Throughout the year the Director of Agriculture was the Executive Officer of the Rubber Industry Smallholders Planting Material Scheme, 1956, and the Field Branch was in charge of the scheme, which has as its object the provision of high yielding planting material to all smallholders who wish to replant under the Rubber Replanting Scheme, and to any others who wish to plant new land. The approved planting material takes the form of Tjir 1 selfed clonal seedlings, or budwood of various recommended clones.

427. During the year, the keen demand for planting material of both types, i.e., clonal seedling stumps and budwood, continued, but all demands for stumps or budwood were met. The trend noticed in previous years of a slackening in relative demand for seedling stumps, and an increase in the demand for budwood, continued, and utilisation of budwood from the nurseries under Departmental control reached almost 100 per cent.

428. To ensure that supplies of budwood in future years is adequate to meet the expected increase in demand, a further 50 acres of nurseries were laid down in 1958. Owing to the time lag between planting a nursery and its coming into production, it will be late 1960 or early 1961 before the first budwood can be cut from these nurseries.

429. Distribution figures of approved planting material over the past five years is shown below:

Year	1954	1955	1956	1957	1958
Budwood (yard) ...	122,564	190,110	191,883	258,834	271,470
Clonal seedlings ...	3,318,643	5,446,689	10,412,173	9,128,563	9,195,539

430. This material was distributed for the following purposes:

	Budwood (yard)	Clonal Seedlings
For new planting ...	99,360	2,268,763
For replanting ...	172,110	6,926,776

431. Progress with new and replanting by smallholders during the past five years is shown in the table below:

Year		New Planting (acres)		Replanting (acres)
1954	...	3,300	...	25,740*
1955	...	8,100	...	28,900*
1956	...	13,100	...	49,870
1957	...	11,300	...	52,478
1958	...	10,800	...	59,694

432. Purchase of seed for the 1958-59 season began in July with a target of 27.5 million seed. Seedfall generally was excellent, and the target figure was achieved by the third week in October. As a result, it will not be necessary to purchase any seed from the short seedfall season in 1959.

433. Germination of seed collected was good, and as a result the percentage of seedlings transplanted to seed collected was higher than for any season past, at 70.5 per cent. Difficulties at transplanting were experienced due to the general drought at the time, but the general appearance of nurseries at the end of the year was excellent.

(B).—*Padi*

434. The policy of the Government is one of self sufficiency in rice production as early as possible. At the end of 1958, local production was sufficient for about 60 per cent of the population's requirements. Increased production can be achieved through higher yields on existing land, or an extension of the acreage under padi cultivation. Unfortunately, land suitable for padi cultivation, and now uncultivated, is strictly limited, so that the main increase in production must come from increases in yield of land now under cultivation.

435. Yields per acre can be increased in the following ways:

- (i) By the provision of improved drainage and irrigation facilities.
- (ii) By the full use of all types of manure, both organic and inorganic, including the manuring of seedling nurseries and transplanted plants.
- (iii) By the use of pure-strain seed of improved varieties.
- (iv) By better control of pests and diseases, and especially rats, stem borers and sucking bugs.
- (v) By the extension of double cropping, wherever the irrigation supply is sufficient.
- (vi) By better farming practices, including the use of ripe and plump seed, larger and manured seedling nurseries, the transplanting of seedlings at the right age, the use of correct spacing of plants in the padi field, regular weeding, harvesting at the correct time and rotation with dry land crops in off-season.

* Amended.

436. The method of yield increase that is likely to give most rapid results is the use of fertilisers, and the extension branch of the Department continued to give this aspect of cultivation high priority in 1958. More than 1,400 demonstrations, either two or three plot, were laid down on farmers land, in all States of the Federation. In addition, the use of manure for seedling nurseries was demonstrated at a large number of sites.

437. The manurial mixture used varies from State to State, but is usually a mixture of phosphate, in the form of Christmas Island rock phosphate, or superphosphate, muriate of potash and nitrogen as sulphate of ammonia or urea. The cost of the mixture varies slightly according to its composition, but averages \$23 per acre at the recommended rate of application of 200 lb. per acre.

438. One form of manuring which has been found to give very economic responses is the use of ammonium phosphate 11:48 to seedling nurseries, especially if it is combined with the use of some organic manure. Such manuring gives the seedlings a good start, and enables transplanting of vigorous seedlings to be done at an early age.

439. The sale of fertilisers for padi is subsidised in five States, namely Kelantan, Trengganu, Negri Sembilan, Malacca and Johore. Approximate sales of fertilisers in the five States have been as follows:

State	Sales in Tons			
	1957		1958	
Kelantan	1,399*	...	1,710	
Trengganu	371*	...	472	
Negri Sembilan ...	219*	...	263	
Malacca	88*	...	93	
Johore	24	...	57	

440. In other States, the sale of fertilisers is not subsidised, but it is known that in Kedah, Penang and Province Wellesley and Perak, substantial quantities of fertilisers for use on padi have been sold, largely bat guano, rock phosphate and sulphate of ammonia.

441. The average yield of padi in the 1957-58 season was 358 gantangs per acre, the highest on record. It is known that individual yields are very much larger in many cases, and possibly one of the most outstanding was that of a farmer in the Peradong area of Jelebu district, Negri Sembilan, who harvested an average of 1,200 gantangs per acre from his holding of two acres. The farmer in question was using a selected Serendah Kuning variety bred by the Department, and used artificial manures recommended, but the yield is the more impressive in that it was the result of a single harvesting. Other outstanding yields have been recorded in Selangor, Penang and Province Wellesley and Kedah.

442. Provided that suitable irrigation is available, double cropping provides a quick way of increasing yields per acre. In

* Corrected Figures.

Province Wellesley and the Yen area of Kedah, double cropping has become an established pattern, and the yields obtained from the off season crop are excellent, that of the 1958 off season crop being 400 gantangs per acre (a record). Elsewhere however, double cropping has not become an established custom, although it has been tried in Perak and Negri Sembilan, and is to be attempted in Kelantan in 1959. One of the major difficulties in getting double cropping accepted is that all farmers in the area chosen must agree to double crop their fields, because if patches of uncultivated ground are left, damage by pests is so heavy that the crop does not become worth while. The economic survey into padi production has shown that the practice of increasing rents in double cropping areas discourages farmers' efforts in this direction.

443. Improved strains of padi are now available for several States, and approximately, 32,000 gantangs of improved seed were distributed during the year, together with 25,000 gantangs of unselected seed. The pure-strain seed was grown on the 50 padi test stations scattered throughout the Federation, and on Departmentally controlled seed farms, in Negri Sembilan and Malacca. The value of planting pure-strain selected seed was demonstrated on 758 plots on farmers land.

444. The "Progressive Farmer" technique, originated in Kelantan and Trengganu, has been extended to other States, and through such farmers valuable extension lessons on various aspects of padi cultivation have been brought home to surrounding farmers.

445. During 1958 the campaign to encourage farmers on the East Coast to make more use of padi straw as a bedding and feeding material for cattle during the padi season, was extended, and nearly 4,000 bales of padi straw were produced by three Departmentally owned baling machines. Bales of padi straw are much easier to handle and store than loose straw.

446. It is unfortunate that the efforts of the Field Branch of the Department to encourage more intensive cultivation of padi land are often frustrated by the insecurity of the cultivator, who is reluctant to spend money on methods of improving yield, because he fears that much of the increase will be lost to him through rent increases. Such an attitude is realistic, as experience and economic survey statistics prove that yield increases in the past have led to heavy increases in rent. The Padi Cultivators (Control of Rent and Security of Tenure) Ordinance, 1955, gives some protection to tenant farmers, but the ordinance is not widely enough enforced in the interest of the farmer to have any great effect on the situation. A further 5,407 agreements were registered during the year, and it is significant that the number of agreements registered has fallen every year since the ordinance came into being, the figures being:

Year	Agreements registered
1956	5,873
1957	5,583
1958	5,407

447. The Kedah Padi Planters' Board continued its redemption of mortgages and usufructuary loans. During the year 68 persons were benefited, the expenditure being \$78,199. A further 138 persons benefited through the purchase and resale to them of 1,734 acres of padi land costing \$407,894.

(C).—Coconut

448. The report of the Agricultural Economist on Johore coconut production was published during the year. The report, which is detailed and comprehensive, makes certain definite recommendations. The survey revealed that one-third of the area (of 129,000 acres) contained less than 10 healthy palms per acre; that future palm population was completely inadequate; and that production over the whole area was low, with a third of the area producing less than two piculs of copra per acre per annum. The report recommended that if replanting were to be undertaken, it should only be in conjunction with other high income mixed crops, with heavy subsidies per acre, and that in most areas coconut holdings should be replanted with rubber, and not coconuts.

449. On the *bris* soils of the East Coast improvement in the yield of coconuts is largely a question of manures and during the year further demonstrations of the effect of using cheap and locally available organic manures on coconuts were commenced. The effect of manures shows quickly on young palms, producing stronger growth, with leaves of a better colour, but the effect of manures on mature palms is much slower, and it may take more than a year before there is much visible effect in improved yields.

450. The most serious pest of coconuts in Malaya is the Rhinoceros beetle, the attacks of which are particularly damaging to young palms. In Johore a campaign was launched among school children for the collection of the beetles, for which a payment of half a cent was made. In November and December more than 5,000 beetles were collected and destroyed in this manner.

451. The unidentified disease of coconuts which made its appearance in Johore in 1957 has still not been identified, although it does not appear to be very virulent, and is not spreading to any significant extent.

452. In Perak, sixty smallholders were given financial assistance by the Planters Loans Board, in order to carry out rehabilitation of coconut holdings.

(D).—Pineapple

453. The depressed state of the pineapple industry, and the low price smallgrowers receive for their fruit as a consequence, have had severe repercussions, and the general standard of maintenance has fallen sharply, while considerable acreages have been totally abandoned. The use of fertilisers, which had been increasing up to 1957, has now ceased, and the number and size of fruits has been seriously reduced. In the circumstances progress achieved by several years of extension work has been largely negated.

(E).—*Fruit*

454. During the year 63,665 budded fruit trees were produced on Departmentally controlled nurseries, the bulk of which were rambutans and durians. Interest in the cultivation of fruit trees has continued to grow, and several intensively managed orchards have appeared, production from which should go far towards augmenting the shortage of good quality fruit. The following figures indicate how the production of budgrafted fruit tree planting material has expanded in recent years:

Year	1953	1954	1955	1956	1957	1958
Budded trees distributed	26,781	39,898	50,582	58,246	57,996	63,665

455. In several States demonstrations of the pruning of mature fruit trees have been carried out, and reports indicate that the results have been promising. Regular pruning of rambutans is important if vigorous fruiting is to be maintained. In addition, demonstrations on the manuring of fruit trees, both with organic and inorganic manures, have been laid down in some States.

456. In many of the Federal Land Development schemes now planned or started, large acreages of fruit are to be planted, in addition to rubber which is the main crop. The fruit acreage is to consist of rambutans, durians and citrus, but the production of good quality citrus planting material is small at present. Accordingly steps have been taken to increase production, and the neck orange shows promise for this purpose.

457. Other miscellaneous planting material distributed during the year was as follows:

Coffee seedlings	...	...	...	7,765
Coffee seed	...	...	...	15 lb.
Cacao pods	...	...	...	965
Coconut seed nuts	...	...	...	2,545
Vegetable seed	...	...	...	47 lb.
Pineapple suckers	...	...	...	22,200
Banana suckers	...	...	...	15,100
Canna suckers	...	...	...	132
Shade trees and other shrubs	...	...	...	8,252
Sweet potato cuttings	...	...	...	13,800
Sugar cane cutting	...	...	...	100
Derris cuttings	...	...	...	26,000
Stylo cuttings	...	...	...	446 bags
Cordia cuttings	...	...	...	3,550
Orchid cuttings/slips	...	...	...	400
Carpet grass	...	...	...	24 bags

(F).—*Amelonado Cacao Seed Gardens*

458. The remaining seed gardens have been maintained in good condition, although the condition of die-back, reported elsewhere, is causing great concern.

459. Close contact with commercial estates have been maintained, and advice has been offered in connection with various difficulties the estates have encountered. The commercially planted acreage at the end of 1958 was :

Locality	Acreage
Trengganu	1,075
Perak	215
Total ...	1,290

2.—MECHANIZATION

460. With the establishment of commercial contractors in most States, the Department has largely withdrawn from the hiring of tractors for mechanical cultivation, although in some States the service is still available, especially for padi cultivation.

461. In Kelantan three straw balers were made available to farmers during the year, and as a result nearly 4,000 bales of straw were produced. This is an important extension activity, as it is hoped through the provision of facilities for baling straw to encourage the stall feeding of cattle during the padi season, with a consequent production of organic manure.

3.—LIVESTOCK

(A.)—Cattle

462. The cattle population throughout the Federation is large, and the problem of the provision of fodder for these animals is considerable. This is especially so on the East Coast, where the very dry periods normally experienced in the middle of the year accentuates the problem. In the north and east of the Federation a leguminous fodder, (*Stylosanthes gracilis*), has been found to grow vigorously, and the State Departments concerned are laying down large numbers of demonstrations to make farmers in the area familiar with the properties of the new fodder.

463. In Kelantan *stylo* has now become extremely popular, and by the end of the year there were 139 acres of the crop planted. Cuttings were supplied free to any applicant, and help was also given in the form of barbed wire to fence off *stylo* plots. The campaign to encourage the planting of *stylo* is run in conjunction with the drive to increase the number of cattle sheds, which the public health authorities are as anxious as the Department to ensure. The greater use of cattle sheds will increase the availability of organic manure, and should enable the production of vegetables and other crops to be greatly increased.

(B.)—Pigs

464. The Middle White x Chinese Black cross is now so well established as the pork pig of Malaya that in some parts of the country, notably Malacca and Penang, more than 90 per cent of the porkers going through slaughter houses consist of cross breds. This development has led to fears that the Chinese Black pig might become extinct, and as a result the Department took

steps during the year to establish nucleus herds of good type Chinese Blacks, the progeny from which will be distributed to breeders in the same way as Middle White boars have been in the past.

465. During the year 213 middle white boars have been sold, and 118 gilts. In addition 2,459 services by middle white boars were made, in new villages and stud centres.

(C).—Poultry

466. Sales of pure-bred cockerels and pullets during the year were as follows :

Cockerels	...	...	...	257
Pullets	...	...	...	271

A total of 124,304 hen eggs and 273 duck eggs were sold for consumption.

(D).—Goats

467. Stocks of Anglo-Nubian goats continue to be built up, and as a result distribution has not yet reached large numbers. The goats appear to be increasing in popularity, especially on the West Coast. During the year 27 bucks and 17 does were distributed, as compared with 13 bucks and 18 does in 1957.

4.—PESTS

468. Help in the control of outbreaks of pests is one of the extension services of the Field Branch, and in most States specialised gangs are available to give assistance when required.

469. In Kedah the following pests are known to have been destroyed :

Rats and Bandicoots	...	...	102,317
Wild Pigs	...	...	544
Squirrels	...	...	5,216
Monkeys	...	...	617
Miscellaneous	...	...	14

470. In Kelantan the campaign against water hyacinth, using selective herbicides, was continued, with good results. Also in Kelantan, three departmentally-owned swingfogs were kept busy during the padi season, dealing with outbreaks of army worm and stem-borers.

5.—NEW VILLAGES

471. Frequent advisory visits have been paid to those villages with an agricultural interest. Typical services that have been provided include the use of stud boars, the provision of insecticides for pest control, provision of planting material, and the bulk purchase of fertilisers for use in the villages.

6.—SETTLEMENT SCHEMES

472. During 1958 there was a large increase in the number of settlement schemes proposed, either under the Land Development Authority, or under the stimulus of the Block New Planting of Rubber Scheme. The Department has been closely concerned with all such schemes. The Land Development Authority schemes

at Ayer Lanas, Kelantan, and Nyalas Road, Malacca, have made excellent progress, although planting of rubber in the latter scheme was held up to some extent by the prolonged drought. Further Land Development Authority schemes which have been proposed, and have started, or are about to start, are in Johore (Endau), Pahang (Bilut Valley), Malacca (Solok Menggong), Trengganu (Chalok), Kedah (Batu Lapan and Bukit Tembaga).

473. Under the Block New Planting of Rubber scheme, numerous proposals for schemes have been put forward, and staff of the Department have been busy undertaking soil surveys and inspections generally. Schemes approved by the end of the year totalled about 25,000 acres.

474. Most of the settlement schemes started for discharged Special Constables have failed, and the colonists seemed not to have much aptitude or desire for agriculture.

7.—RURAL AGRICULTURAL TRAINING

475. From a beginning at Cheras, in Selangor, in 1952, all States now have a Rural Training Centre, and at least two States, Johore and Pahang, are planning further centres. The latest centre to be started is at Degong, in Perak, where the students are at present housed in temporary buildings, but where a permanent structure is to be built in 1959.

476. During the year, 1,876 students passed through the training centres, of which 20 were young women. The demand for places at training centres is high, and not all the applicants can be accepted, but priority is given to young persons, who have or are about to obtain land for their own cultivation. The length of the courses varies from seven days in Kelantan to two months in Negri Sembilan; usually the courses are general in nature, but occasionally short courses dealing with specific subjects, i.e., rubber or coconuts, are arranged.

(A).—*Newsletter*

477. Agricultural newsletters of topical and local interest were published and issued free in Kelantan, Trengganu, Penang and Malacca. Altogether 16 numbers were issued, totalling 134,000 copies, of which 12 were in Malay and 4 in Chinese.

(B).—*Lectures, Talks and Civics Courses*

478. A major part of agricultural extension work must be done through the medium of lectures and talks, and the opportunity taken of any gathering of farmers to discuss with them improved methods of agriculture. Staff of the Field Branch gave many such lectures at Mosques, Community Halls, Penghulus Courts, rural council meetings and schools. During the running of Civics Courses, one of the major topics discussed is agriculture, and many such courses were held at agricultural stations.

(C).—*Progressive Farmers*

479. The development of the progressive farmer technique in agricultural extension work is relatively recent, but it is

expanding quickly, and has shown excellent results. Energetic and adaptable farmers in the rural areas are selected for assistance, which is given free, provided that the farmer co-operates to the extent of following advice issued by field workers. In the east coast States this concept has worked particularly well, and the number of progressive farmers increased steadily throughout the year. Such farmers provide focal points for further extension work, especially when it is obvious that their farms are increasing in productivity and profitability.

(D).—*Agricultural Shows and Padi Competitions*

480. During the year Agricultural Shows were held in Trengganu, Negri Sembilan, Malacca, Selangor and Penang.

481. District and State padi shows were held in all States and the best entries for these shows were forwarded to Kuala Lumpur for the Malayan padi competition in June.

D.—AGRICULTURAL EDUCATION

1.—ADVISORY COUNCIL

482. The Advisory Council held its only meeting of the year on Wednesday, 15th January. It was also the last meeting attended by the then Chairman, Mr. R. G. Heath, before his retirement as Director of Agriculture. The Hon'ble Mr. Yap Kim Hock, J.P., in his adjournment speech, on behalf of the Council members, thanked Mr. Heath for the excellent work he had done for the College and wished that the Council's appreciation be recorded.

483. The organisation of the Council was revised in September when the Hon'ble the Minister of Agriculture appointed the Secretary to the Minister as Chairman of the Council and the Director of Agriculture as Deputy Chairman.

484. There was also one change in the membership of the Council. Mr. J. C. Mathison, O.B.E., replaced the Hon'ble Mr. H. A. Campbell, C.B.E., as the representative of the Rubber Producers' Council.

485. Membership of the Council, at the end of 1958 was as follows:

The Secretary to the Minister of Agriculture (*Chairman*).

The Director of Agriculture, Federation of Malaya (*Deputy Chairman*).

The Director of Veterinary Services, Federation of Malaya.

The Director, Rubber Research Institute of Malaya.

The Principal, Sultan Idris Training College, Tanjong Malim.

The Principal, College of Agriculture, Malaya.

Mr. J. C. Mathison, O.B.E., representative of the Rubber Producers' Council, Federation of Malaya.

Mr. Chan Hin Cheung, representative of the Malayan Estates Owners' Association.

The Hon'ble Enche' Hashim bin Awang, J.P.

The Hon'ble Mr. Yap Kim Hock, J.P.

Dato' Ja'afar bin Mampak, O.B.E., J.P.

Enche' Jamaluddin bin Aji.

Enche' Ismail bin Yusoff.

The Secretary, Alumni Association, College of Agriculture,
Malaya.

The Registrar and Bursar, College of Agriculture, Malaya
(*Secretary*).

2.—ACADEMIC SESSIONS

486. *Diploma Course*.—The 1958/9 academic year for the Diploma Course commenced its session on 11th June and the terms for the calendar year were divided as follows:

Third term, 1957/8 session—8th January to 16th April.

First term, 1958/9 session—11th June to 3rd September.

Second term, 1958/9 session—24th September to 17th December.

487. *Certificate Course*.—Two intakes of trainees were admitted for training during the year. The earlier intake reported for training at the School of Agriculture, Telok Chengai, Kedah, in May to coincide with the padi planting season of the State. The later intake was admitted to the School of Agriculture, Serdang, in October.

3.—REGISTER OF STUDENTS

488. The student population of the two courses reached a record figure in 1958, though by no means the highest in view of the proposed future expansion of the College. The Register of students at the end of the year showed 71 scholars in the Diploma Course and 60 trainees (including 3 female trainees) in the Certificate Course.

489. The first year Diploma Course started with 25 scholars comprising 15 Federal Major Scholars, 6 Rubber Research Scholars and 4 fee-paying students. The Negri Sembilan Federal Major Scholar gave up his scholarship in the later part of the first term to join the Technical College. It was not possible to fill up the vacancy thus created by offering it to another applicant owing to the lateness of the year. For ease of reference, the different category of students under training is given in Appendix I.

490. *Admission of Students*.—The number of applications for admission to the 1958/9 session far exceeded the limited accommodation and training facilities available in the College at present. It is anticipated that more applications will be received for the same 25 places available in the next academic year. Without major expansion in the immediate future, the College will be turning more and more applications away every year.

491. There were 205 eligible and qualified applicants for the 15 Federal Major Scholarships awarded in 1958 and 14 candidates applied for the 4 fee-paying places. The 1957 figures were 157 and 20 respectively. Information received from the Rubber

Research Institute of Malaya showed that 146 formal interviews were granted to applicants applying for the Institute's 6 scholarships tenable at the College.

492. Though the College and the Rubber Research Institute's figures cannot be added for total consideration because many applicants applied for both scholarships, the 1958 figure for those seeking admission is nevertheless very high.

493. A detailed account of the number of applicants for the Federal Major Scholarships is given in Appendix II.

4.—TRAINING

494. *Diploma Course*.—No major changes were introduced in the lecture syllabus of the Diploma Course. In addition to the set subjects in the syllabus, a short but unfinished course in Agricultural Economics was conducted by the Assistant Agricultural Economist who later left for the United Kingdom for post-graduate studies. Lectures on the Principles of Marketing were also given by Mr. Thomson, F.A.O. expert attached to the Ministry of Commerce and Industry. Arrangements have also been made with the Co-operative Department to give a series of lectures on Co-operative Development to the third year students.

495. Facilities for lecture and laboratory work were much improved with the purchase of new equipments and teaching aids. Extra academic activities in Higher School Certificate courses were given to the final year students who sat for these examinations in Chemistry, Botany and Zoology last November.

496. Practical training was, in general, based on the same lines as before with more emphasis on farm management. More than 5 acres had been added to the planted acreage of the College Farm. The rubber and food crops area were similarly expanded. The sites for durian and rambutan nurseries in Field 35 and 36 were extended for training in budgrafting technique.

497. A new rabbit house was constructed, the plant house enlarged, a new citrus area and a new fruit orchard established during the year to provide more facilities for practical training.

498. Students also received practical training in mechanisation from the Agricultural Engineer. The technique in padi hybridisation was taught to the final year students by the Botanist from Headquarters and field work in Agricultural Extension was conducted by the Agricultural Assistants, Kuala Langat and Kuala Selangor.

499. Instructional visits for training in tea, coffee, rubber, pineapple, padi, etc., were organised during the year. An educational tour for the second and third year students to Perak, Penang and Kedah was made during the second term holidays. The students visited Jenderata Estate; citrus orchards around Telok Anson; Kea Farm, Notre Dame flower gardens and the Department's Agricultural Station in Cameron Highlands and agricultural and padi experiment stations in the State visited.

500. For the first time in the history of the College, training in practical surveying was conducted outside the College area. A

team of 12 available students under the lecturer in Surveying carried out and completed the demarcation of 167 two-acre lots of the F.L.D.A's Development Scheme at Ayer Lanas, Kelantan, during the long vacation in April. The team was able to accomplish the survey under jungle conditions in less than 30 working days—a noteworthy accomplishment which was greatly appreciated by the Chairman of the Tanah Merah Land Development Board, Kelantan.

501. Arrangements have been made for students to carry out a similar survey for another of the F.L.D.A. schemes at Kemmendore, Malacca, next April.

502. *Certificate Course*.—The training of in-service officers—Junior Agricultural Assistant probationers, penghulus, etc., was in full operation when the May, 1958, intake of trainees were admitted. The first batch of trainees to undergo the full 17 months of the revised scheme of instruction graduated in September.

503. *Academic Training*.—Trainees received theoretical instruction on dryland crops and other ancillary subjects at the Serdang School. At Telok Chengai, padi cultivation was fully taught in conjunction with the six months practical work on this crop. Other major subjects conducted in the Kedah School were Agricultural Extension, Principles of Agriculture and Plant Protection.

504. There were 12 to 13 lecture hours a week at both training centres and no difficulties were encountered in completing the syllabus within the prescribed number of hours allocated to each subject.

505. *Practical Training*.—The crop subjects taught were followed up with practical work covering all the important aspects of each individual subject. The training on pineapple and coffee was intensively conducted at the Federal Experiment Station, Jalan Kebun and nearby estates.

506. At Telok Chengai, 10 relongs (7.34 acres) of padi land belonging to the Botanical Division were allocated to the School for training purposes. The whole area was prepared, planted and harvested by the trainees. For more thorough training, two relongs were treated and planted according to the Krian system of padi cultivation. In addition to the normal practices of padi cultivation, the trainees received practical experience in the conduct and layout of padi experiments under the field staff of the Agronomy Branch and Botanical Division.

507. Field training on coconut was conducted at the Federal Coconut Station, Telok Bahru, Telok Anson. Each stream of trainees spent a month on this practical course. Another month was spent at the Gajah Mati Agricultural Station, Kedah, where work on citrus (grape fruit), chikus and other fruits were taught.

508. Experience gained in the running of the Certificate Course necessitated the revision of the lecture hours of the various subjects in the teaching syllabus which had also been enlarged to include some of the smallholders' crops hitherto omitted.

Since the Certificate Course is essentially an in-service training scheme for the Junior Agricultural Assistants, the examination syllabus has also been revised by the Examinations Board of the Department to be in line with changes made in the instructional courses.

509. With the third School of Agriculture now being established at Lundang, Kota Bahru, Kelantan, the instruction in East Coast agriculture will be incorporated in the 1959 or 1960 training programme and the aim of giving the Junior Agricultural Assistants a sound and thorough training will be well advanced.

510. *Library*.—Further expansion of the library was carried out during the year. With additional books from the Head Office library and purchases made out of the \$2,500 Special Expenditure for 1958, the number of books in the students' library was 1,007 volumes at the end of the year.

511. More books are expected from the Crown Agents and with another \$2,500 allocated in 1959, the requirements of the students will be appreciably answered. An application for more staff reference books was made under the Colombo Plan Assistance Programme and the request has been favourably received by a member country of the Colombo Plan.

5.—HEALTH AND RECREATION

512. The standard of student health remained good throughout the year. Only 9 Diploma Course students were admitted to hospital for treatment and 74 student days were lost through hospitalisation. A total of 231 days were lost in field work—38 by third year students, 100 by the second years and 93 by the first years. With the Certificate Course at Serdang, the loss was 13 days through hospitalisation and 21 in field work.

513. Recreational facilities, both outdoor and indoor were well provided for—more adequate than the students could spare their time to indulge in.

6.—CATERING

514. Supplies of uncooked food to the College and Schools were by approved contract in line with all government training institutions. This still remained the responsibility of the Registrar and Bursar who was assisted by Hostel Superintendents.

515. Catering charges averaged \$1.50 per student per day in the Diploma Course and Certificate Course trainees each had to pay up to a maximum of \$45 a month over and above which the charges were subsidised by Government up to 50 cents per student day.

7.—STAFF

516. The staff position improved slightly in the College with the appointments of Tuan Haji Abu bin Hassan and Mrs. Mary Joseph. Tuan Haji Abu Hassan was appointed as Farm Manager in December and Mrs. Joseph who joined the staff in April was assigned to lecture to the first year students in Chemistry and Botany.

517. Che Khalid bin Abdul Rahman, Senior Lecturer, attended the F.A.O. sponsored Specialist Extension Course from 11th April to 24th May at the College of Agriculture, Los Banos, Philippines.

518. Che Ahmad Shariff bin Abdul Rashid, an Instructor in the Certificate Course was awarded a study course in Agricultural Extension and Community Development under the Colombo Plan. He left for India in September.

519. The College continued to receive assistance from part-time lecturers of the Agronomy Branch and Botanical Division throughout the year.

8.—GENERAL

520. Hostel and catering facilities were made available to the Social Welfare Department for a Youth Leadership Course in agriculture during the September holidays and to the fourth year Engineering students of the University of Malaya for their annual survey camp during the December holidays.

E.—PUBLICATIONS AND LIBRARY

1.—PUBLICATIONS

521. The Department's principal publications are the Malayan Agricultural Journal, technical bulletins and leaflets in three languages, used in agricultural extension work.

(i) *Malayan Agricultural Journal*

522. Four issues of the Malayan Agricultural Journal were published in 1958. They were Vol. 40, No. 4 (with index) and Vol. 41, No. 1, 2 and 3. Each issue contained reports on current investigations and extension work, in addition to the following original articles which are listed with the distribution figures for each number.

Vol. 40, No. 4.—(Sales 464, Free or Exchange 684. Total 1,148)

The Sri Menanti, Senggarang and Muar Drainage Schemes, Johore. By J. N. Wilson.

Pineapple Fruit Collapse. By Anthony Johnston.

Natural Cross-Pollination in Rice in Malaya. By F. B. Brown.

A Test of Spray Deposits on Cocoa Foliage Using a Fluorescent Tracer. By Majorie Henderson.

Insecticidal Control of the Diamond Back Moth (*Plutella maculipennis* Curt.) on Cabbages at Cameron Highlands. By Majorie Henderson.

Kedah Padi Planters Board. By A. L. Barcroft.

Master Farmers of Malaya, III. Yaacob bin Sulong. By Hussein bin Isa.

Master Farmers of Malaya, IV. Mohamed Yusof bin Hussin. By E. F. Allen.

- Vol. 41, No. 1.*—(Sales 418, Free or Exchange 675. Total 1,093)
- Soil Survey Reports. No. 7, The Bukit Goh Forest Reserve, Near Kuantan, Pahang. By Wm. P. Panton.
- Diseases of Padi. By Anthony Johnston.
- Leaf Analysis in Relation to Yield and Quality of Pineapples. By K. Kanapathy.
- Grapefruit Cultivation at Gajah Mati Agricultural Station, Kedah. By M. G. Hawson.
- A Note on Jute Cultivation in Malaya. By E. F. Allen.
- Microfermentation of Cocoa for Selection Work. By F. N. G. Conaty and M. Smith.
- Master Farmers of Malaya, V. Abdul Manan bin Pawiroh. By E. F. Allen.
- Master Farmers of Malaya, VI. Haji Awang bin Haji Nasib. By Zainalabidin bin Maamor.
- Vol. 41, No. 2.*—(Sales 424, Free or Exchange 660. Total 1,084)
- The Vegetative Propagation of Tea on the Lowlands of Malaya. By C. Whitehead.
- Cocoa Drying. By D. W. M. Haynes.
- The Cultivation of Tomato as an Off-Season Crop on Padi Land. By J. S. Ure.
- Notes on the Cultivation of *Rauwolfia* in Malaya. By E. F. Allen.
- Master Farmers of Malaya, VII. Tuan Sembok. By Mohamad bin Jamil.
- Vol. 41, No. 3.*—(Sales 415, Free or Exchange 661. Total 1,076)
- Mineral Nutrition of the Oil Palm in Malaya. By J. K. Coulter.
- Fungicidal Seed Dressing of Soya Bean, Groundnut and Long Bean. By Anthony Johnston.
- Dry Season Cultivation of Vegetables and Food Crops on Islands and River Banks in Kelantan. By Haji Mahmood bin Haji Yaacob.
- The Establishment and Maintenance of Fruit Trees. By C. Whitehead.
- Master Farmers of Malaya, VIII. Omar bin Mohamad. By Ariffin bin Mohd. Zain.

(ii) *Bulletins*

523. Bulletin No. 103, "The Economics of Padi Production in North Malaya, Part I", by T. B. Wilson. (Sales 337, Free or Exchange 569. Total 906).

Bulletin No. 104, "West Johore Coconut Production Survey", by T. B. Wilson. (Sales 16, Free or Exchange 364. Total 380).

Bulletin No. 105, "Reconnaissance Soil Survey of Trengganu", by Wm. P. Panton. Distribution of copies will commence in 1959.

(iii) *Leaflets*

524. Agricultural leaflets are published by the Department for free distribution within the Federation of Malaya, usually in three languages, Malay, Chinese and English. The following were published or reprinted during 1958:

	Distributed
<i>In Malay:</i>	
Grow Your Own Vegetables	2,763
How to Cultivate Vegetable and Food Crops	4,562
Home Canning and Jam Making	1,970
Duck Keeping	1,480
Coffee	1,323
Vegetable Cultivation. Ladies Finger, Tomato, Brinjal and Chillies	450
Vegetable Cultivation, Long Bean, French Bean, Cucumber and Loofah	450
The Pineapple in Malaya	1,990
Soil Conservation and Erosion Control ...	656
<i>In Chinese:</i>	
Home Canning and Jam Making	618
Duck Keeping	535
Coffee	654
Soil Conservation and Erosion Control ...	540
<i>In English:</i>	
Home Canning and Jam Making	500
The Pineapple in Malaya	1,000
Coffee	897
Soil Conservation and Erosion Control ...	865
Duck Keeping	970
Grow Your Own Vegetables	443
The Establishment and Maintenance of Fruit Trees	219
Total ...	22,885

(iv) *Distribution of Publications*

525. About 320 copies of each issue of the Malayan Agricultural Journal are exchanged for publications of other research organisations, educational institutions, etc. The publications received in exchange are among the most valuable materials in the Headquarters library.

526. The following summary shows the number of back issues of the various publications of the Department distributed during 1958:

	Sales	Free and Exchange	Total
Malayan Agricultural Journal	775	997	1,772
Malayan Planting Manual No. 2	7	22	29
Special Bulletins	201	397	598

	Sales	Free and Exchange	Total
Agricultural Leaflets ...	—	2,471	2,471
Poultry Leaflets ...	—	1,057	1,057
Grow More Food Series ...	—	2,060	2,060
Malay Agricultural Journal ...	—	—	—
Leaflets in Malay ...	—	10,457*	10,457*
Chinese Agricultural Journal ...	—	299	299
Leaflets in Chinese ...	—	24,527*	24,527*
Tamil Agricultural Journal ...	—	14	14
Leaflets in Tamil ...	—	5	5
			43,289

527. The following is a summary of all publications sold and distributed during the year:

	Sales	Free and Exchange	Total
English ...	3,057	10,617	13,674
Malay ...	—	26,101	26,101
Chinese ...	—	27,173	27,173
Tamil ...	—	19	19
	3,057	63,910	66,967

528. Comparative figures for total revenue received during 1957 and 1958 from the sale of publications and from advertisements are as follows:

	1957	1958
	\$	\$
Sale of publications ...	5,105	5,171
Advertisements ...	1,309	1,314
	6,414	6,485

2.—LIBRARY

529. The Headquarters library of the Department of Agriculture contains nearly 4,100 books, about 30,310 bound volumes of periodicals and nearly 1,000 unbound and incomplete volumes of periodicals, most of which were issued pre-war. In addition, many thousands of pamphlets, leaflets and reprints have been received and most of these have been taken into the library stock. This considerable volume of printed matter accumulated over a period of 53 years, forms one of the largest libraries on agriculture and related topics to be found in South-East Asia.

530. The library is open to the public daily and students, teachers and others use it as a source of reference material.

* Stock clearance—issued to State Agricultural Departments for distribution.

F.—SCHEMES

1.—INVESTIGATION INTO MECHANISATION OF RICE CULTIVATION

531. A sum of \$22,431.00 was provided in the Federal Estimates, 1958, for the investigations into Mechanisation of Rice Cultivation and an application for Virement of \$10,000 was approved in October making a total of \$32,431.00. This scheme formerly known as Colonial Development and Welfare Scheme No. 2225 is designed to assess the possibilities of mechanisation as an aid to padi cultivation by smallholders. A pilot mechanisation scheme of 50 acres has been established in an area where, through the construction of drainage and irrigation works, a considerable amount of new land can be opened up for padi cultivation. The aim is to discover whether, with the aid of complete or partial mechanisation, a cultivator can plant considerably larger acreage than he does at present, thereby (a) producing a greater amount of padi in excess of his own needs and (b) raising his standard of living. The Ruler in Council, Perak, has approved the reservation of 100 acres as a site for Padi Trials and ancillaries in September. The expenditure at the end of the year was \$23,979.77.

2.—PADI SOILS/WATER EXPERIMENTAL STATION

532. A provision of \$364,285 was provided in the Federal Estimates, 1958, for Padi/Water Experimental Station (formerly known as Colonial Development and Welfare Scheme No. R. 747) on which field investigations into the effects of various types of water control on the growth and yield of padi would be carried out. This scheme, designed to provide more information on the function of water in rice cultivation, should enable improvements to be made in the design of drainage and irrigation schemes and lead to a material increase of rice production. The scheme is administered in close co-operation with the Department of Drainage and Irrigation and commenced in 1956. Expenditure incurred for the year was \$140,649.31.

SECTION V

AGRICULTURAL LEGISLATION

1.—THE PINEAPPLE INDUSTRY (AMENDMENT) ORDINANCE, 1958

533. This Ordinance was passed in the Legislative Council on 31st July, 1958, to amend the Pineapple Industry Ordinance, 1957, and came into force on 1st November, 1958, *vide* Legal Notification No. 306 of 23rd October, 1958.

2.—FEES ORDINANCE, 1951

534. Fees (Analyses) (Amendment) Order, 1958, came into force on 1st January, 1958.

535. The Schedule of Fees (Analyses) Order, 1952, was amended by adding a new item at the end thereof as below :

“(17) Additional copies of reports or certificates—

(a) for each additional copy or excerpt of report—
\$1-\$10.

(b) for each additional copy or excerpt of certificate—
\$1-\$10.”

Legal Notification No. 139 of 10th July, 1958, refers.

3.—APPOINTMENT MADE UNDER PINEAPPLE INDUSTRY
ORDINANCE, 1957

(No. 13 of 1957)

536. The Director of Agriculture was appointed a member of the Board *vide* Federal Government *Gazette* No. 196 of 16th January, 1958. Later the name of “Director of Agriculture” was deleted and substituted by “An officer of the Department of Agriculture” *vide* Federal Government *Gazette* No. 2205 of 26th June, 1958.

P. G. COLEMAN,
Acting Director of Agriculture,
Federation of Malaya

APPENDIX I

REGISTER OF STUDENTS—DECEMBER, 1958

DIPLOMA COURSE

3rd Year Students

	Malays	Chinese	Indians	Total
Federal Government Scholars ...	9	5	—	14
R.R.I. Students in Training ...	—	1	—	1
Singapore and North Borneo Government Scholars ...	—	4	—	4
Private Students ...	—	1	—	1
	9	11	—	20

2nd Year Students

Federal Government Scholars ...	11	4	—	15
R.R.I. Students in Training ...	2	2	—	4
Singapore and Sarawak Government Scholars ...	—	3	—	3
J.A.A. Major Scholars ...	2	—	—	2
Private Students ...	—	2	1	3
	15	11	1	27

1st Year Students

Federal Government Scholars ...	10	4	—	14
R.R.I. Students in Training ...	4	2	—	6
Private Students ...	—	3	1	4
	14	9	1	24

CERTIFICATE COURSE

Probationer Junior Agricultural Assistant ...	44*	—	—	44*
State Government Sponsored Trainees ...	12	—	—	12
Assistant Penghulus in Training, Johore ...	2	—	—	2
Brunei Government Trainees ...	2	—	—	2
	60	—	—	60
GRAND TOTAL ...	98	31	2	131

* Includes 3 female probationers.

APPENDIX II

APPLICANTS FOR FEDERAL MAJOR SCHOLARSHIPS, 1958

State	Total Number of Applicants	Category of Applicants								Total	
		Malays		Chinese		Indians					
		School Certificate		School Certificate		School Certificate		School Certificate		Grade I	Grade II
		Grade I	Grade II	Grade I	Grade II	Grade I	Grade II	Grade I	Grade II		
Perlis	1	—	1	—	—	—	—	—	—	—	1
Kedah	9	—	4	—	3	1	1	1	1	1	8
Penang and P. Wellesley ..	28	—	2	2	20	—	4	2	2	2	26
Perak	66	—	10	12	35	3	6	15	15	51	51
Selangor	26	—	2	1	14	—	9	1	1	1	25
Negri Sembilan	9	—	2	1	3	1	2	2	2	7	7
Malacca	14	—	3	1	7	—	3	1	1	13	13
Johore	30	—	4	7	16	1	2	8	8	22	22
Pahang	17	—	1	2	14	—	—	2	2	15	15
Kelantan	5	—	5	—	—	—	—	—	—	5	5
TOTALS	205	—	34	26	112	6	27	32	32	173	173

No applicants were received from the State Trengganu

APPENDIX III

AREAS UNDER VARIOUS AGRICULTURAL CROPS

(acres)

	1952	1953	1954	1955	1956	1957	1958
Rubber	3,612,820*	3,727,540*	3,528,000*	3,525,000*	3,517,000*	3,520,000*	3,520,000*
Oil Palm	100,182	108,265	109,000	111,000	115,183	116,000	122,000
Coconut	512,967	512,744	494,000	495,000	517,060	517,000	517,000
Padi (Rice)—All types	831,050	834,010	845,990	891,090	875,880	896,510	908,590
Total	5,057,019*	5,182,559*	4,976,990*	5,022,090*	5,025,123*	5,049,510*	5,067,590*
Food Crops:							
Tapioca	23,428	28,183	30,947	31,244	36,344	38,206	35,790
Sweet Potato	13,449	16,735	19,274	19,394	19,183	21,121	23,190
Sago	6,364	6,826	6,954	7,080	6,821	6,818	6,540
Sugar Cane	1,861	2,008	2,050	2,022	1,991	2,300	2,300
Groundnut	2,479	2,485	2,785	3,311	2,880	3,353	4,560
Maize	7,332	4,224	8,849	6,744	6,173	6,904	11,180
Yam	1,101	1,099	1,436	1,704	1,579	1,755	1,560
Colocasia	3,390	3,404	3,278	3,439	3,528	3,950	3,950
Water Melon†	—	—	—	—	—	3,634	4,140
Soya Bean	117	152	223	194	137	181	130
Pulses	1,569	1,945	1,556	1,415	836	695	630
Other Market Garden	12,665	15,021	18,264	20,305	22,258	21,744	26,640
Total Food Crops	73,755	82,082	95,616	96,852	101,730	106,531	120,610

* Estimated figure only, as no accurate figures are available for smallholding acreages of rubber. For each year the smallholding acreage has been estimated as 1,500,000 acres.

† Water melon, separately shown for 1958 (previously in "other Market Garden") instead of Ragi (now in "other Market Garden").

APPENDIX III—(cont.)

AREAS UNDER VARIOUS AGRICULTURAL CROPS—(cont.)

(acres)

		1952	1953	1954	1955	1956	1957	1958
FRUITS:								
Pineapple	..	24,843	23,930	27,949	34,848	44,777	45,550	44,360
Banana	..	40,257	48,508	56,384	56,831	60,545	57,928	64,370
Papaya	..	478	568	749	777	862	808	1,040
Cashew Nut	..	2,120	2,105	2,134	2,083	2,166	1,583	1,790
Durian	..	26,652	27,394	28,301	31,040	31,919	38,329	35,390
Rambutan	..	15,848	17,951	17,850	18,802	19,418	20,445	24,200
Mangosteen	..	8,025	8,561	8,588	8,408	8,350	8,425	8,900
Citrus Fruits	..	2,312	2,854	3,387	5,081	5,837	6,206	7,710
Mango	..	2,386	2,594	2,468	2,572	2,497	2,455	2,810
Chiku	..	2,014	2,001	1,995	1,900	2,009	1,957	1,970
Duku	..	3,436	3,775	3,806	3,777	3,782	6,029	7,140
Rambai	..	2,460	2,499	2,517	2,492	2,418	2,865	2,990
Chempedek	..	3,061	3,187	3,160	3,494	3,473	3,498	3,920
Jack Fruit	..	1,404	1,572	1,559	1,443	1,553	1,552	1,670
Other Fruits	..	28,880	26,118	26,090	22,468	24,612	16,784	6,280
Total Fruits	..	164,176	173,617	186,937	196,016	214,218	214,414	214,540

APPENDIX III—(cont.)

AREAS UNDER VARIOUS AGRICULTURAL CROPS—(cont.)

		(acres)					
SPICES:		1952	1953	1954	1955	1956	1957
Areca nut		44,862	46,300	45,417	40,303	42,974	41,092
Chillies		3,258	3,768	4,159	4,478	4,394	3,698
Pepper		204	377	678	676	724	630
Ginger		1,013	974	1,263	1,344	1,498	1,532
Sirih		2,900	2,983	3,100	2,967	2,653	2,904
Nutmeg		59	55	54	82	71	95
Cloves		195	183	176	175	188	190
Turmeric		731	959	1,097	1,088	1,086	1,038
Total Spices	..	53,222	55,599	55,944	51,113	53,588	51,240
							52,300

APPENDIX III—(cont.)

AREAS UNDER VARIOUS AGRICULTURAL CROPS—(cont.)

		1952	1953	1954	1955	1956	1957	1958
(acres)								
MISCELLANEOUS:								
Tea ..	..	8,561	8,719	9,000	9,000	9,318	9,742	10,590
Coffee ..	..	9,299	9,286	10,557	12,603	13,078	14,210	14,840
Cacao ..	..	295	302	418	655	946	1,321	1,550
Tobacco ..	..	3,830	2,579	4,489	4,200	4,018	6,096	6,330
Derris ..	..	244	426	463	512	684	1,486	1,620
Nipah ..	..	33,749	34,105	34,425	34,878	33,339	32,466	31,540
Gambier ..	..	932	908	910	775	716	700	700
Kapok ..	..	1,411	1,675	1,579	1,575	1,531	1,510	1,470
Impeacuanha ..	..	250	143	143	140	10	60	80
Patchouli ..	..	8	37	81	83	26	54	50
Citronella ..	..	27	29	30	21	17	10	20
Gutta Percha ..	..	5,635	5,635	5,471	4,642	4,642	4,157	3,820
Other Miscellaneous ..	..	1,437	1,448	1,494	1,376	2,054	785	740
Total Miscellaneous ..	..	65,678	65,292	69,060	70,460	70,379	72,597	73,350
TOTAL ALL CROPS ..	..	5,413,850*	5,559,149*	5,384,547*	5,436,531*	5,465,038*	5,494,292*	5,528,290*

* Estimated figure only, as no accurate figures are available for smallholding acreages of rubber. For each year the smallholding acreage has been estimated as 1,500,000 acres.

